AUGUST 13, 1938

ELECTRICAL WORLD

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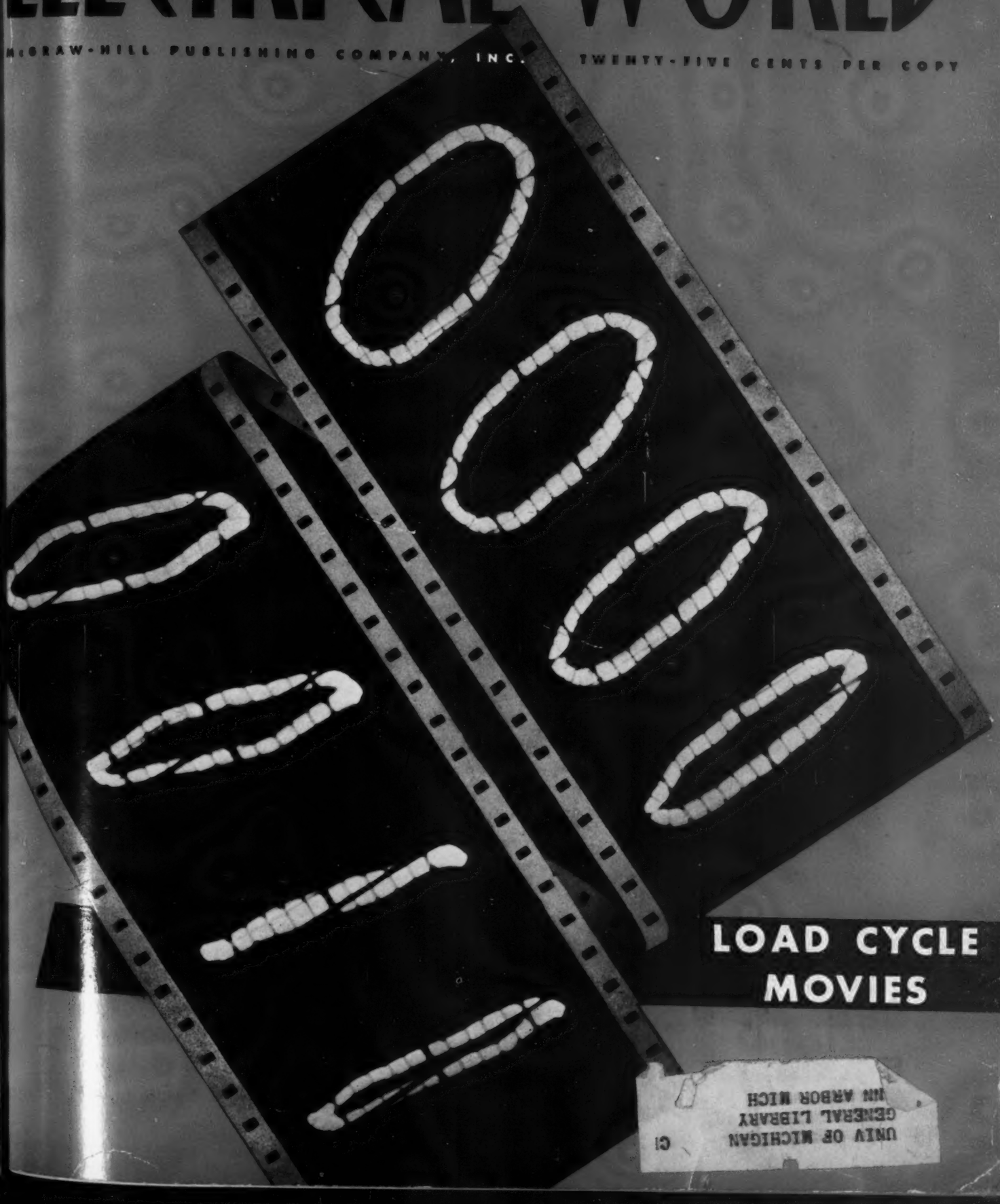

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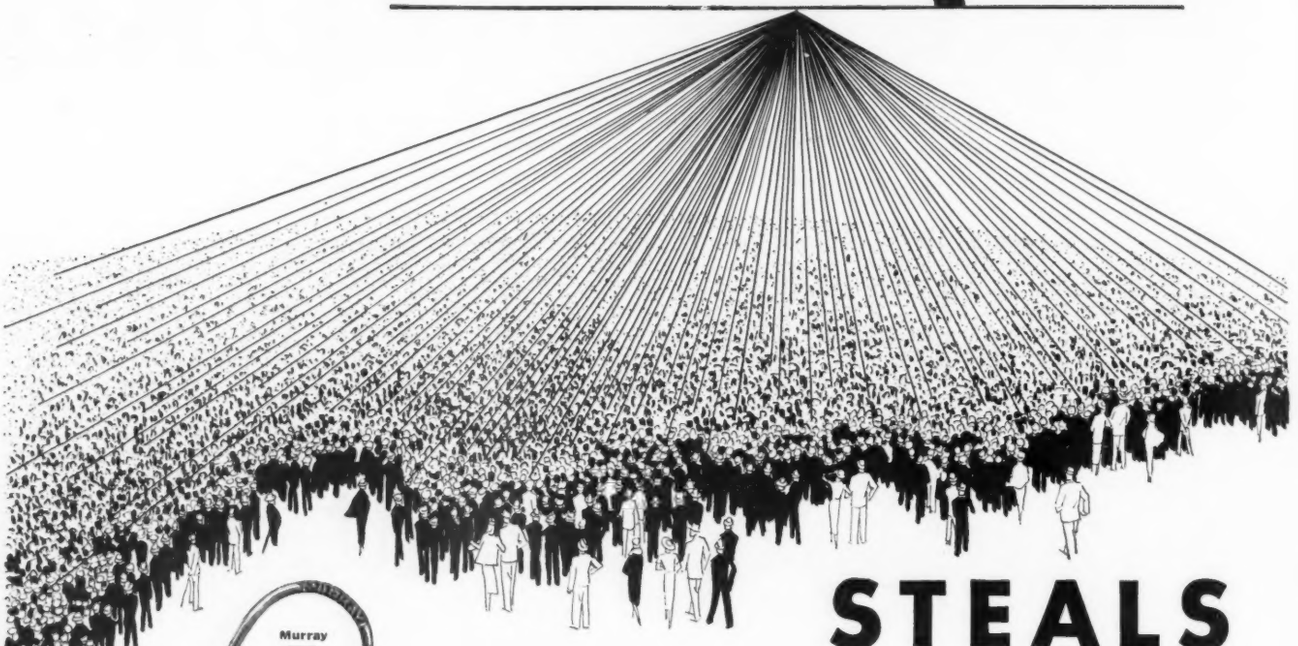

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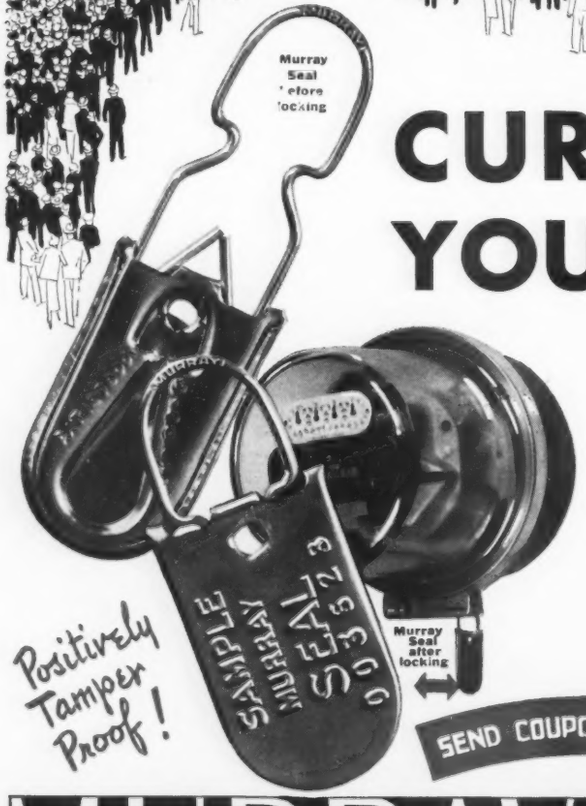

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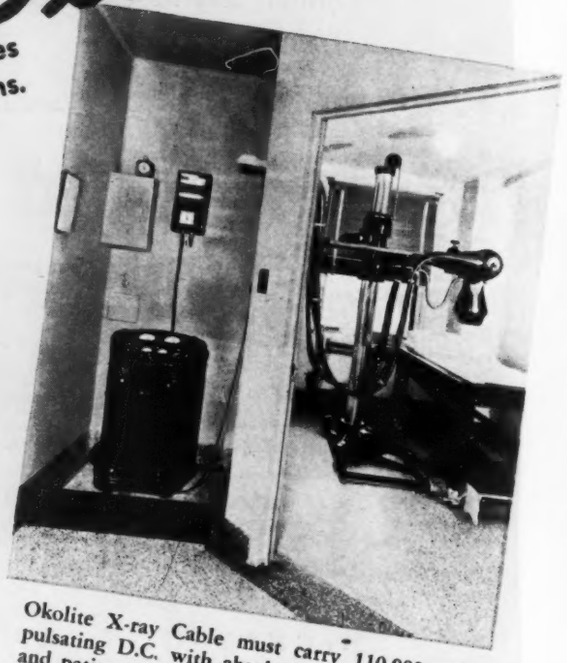
Air Transport completes journey of Okoprene dredge cable to heart of New Guinea where gold mining operations are carried on under rapid alternations of tropical sun and storms. Maintenance must be at a minimum, failure can not be tolerated.

Underground cable meets submarine requirements. Okonite Insulated Fire Alarm Cables, sections of which are more than 35 years old, functioned perfectly under flood conditions in Springfield, Mass.

Installations Illustrated

A pictorial record of the successful use of Okonite wires and cables under extraordinary and unforeseen conditions.

However romantic submarine cables may be, they offer real problems. Here is one of two Okonite submarine cables being laid 125 fathoms deep (750 feet to a land-lubber) in Puget Sound. These rubber power cables, the deepest ever laid, carry 13,200 volts over their 4½-mile lengths.



Okolite X-ray Cable must carry 110,000 volts pulsating D.C. with absolute safety to operator and patient. It is used by the great majority of manufacturers of X-ray apparatus—thereby making a major contribution to the welfare of mankind.

You, too, may have a wire or cable problem that is tough to lick. If so, write us and let our engineers consult with you regarding it.

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OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

ELECTRICAL WORLD

AUGUST 13, 1938

No Dual Standard

Is the government water power program beginning to bog down? Poor engineering, complete disregard of sound accounting practices. and lack of preliminary investigation to determine the market for power are beginning to show up as the government projects pass from the stage of promises to performance.

In Texas a multiple-purpose dam showed its inadequacy to protect against flood. In Nebraska the government projects have been striving desperately to secure private plants so that they might have through steam a firm source of power. Out in the Northwest Administrator Ross, having no market for Bonneville and Grand Coulee power, is trying to bolster up the confidence of his public through extravagant visions of serving Chicago, and even New York, in the not too far distant future. And all the while down in the Tennessee Valley Director David Lilienthal is striving to explain to a Congressional committee that a yardstick isn't a yardstick, that a red ink balance is really a profit.

There cannot be one law of engineering or of economics for government and another for private industry. The government can continue to pour money indefinitely into its huge projects and still they will fail unless the same elements for a successful venture are present as are necessary for a private undertaking. No private capital could be secured for the development of power unless it were first determined beyond any reasonable doubt that the project would be sound from the standpoint of engineering and that there was a market susceptible of development sufficiently quickly to bring a return upon the investment.

The government apparently has gone on the theory that the wish can be father to the deed and that its unlimited funds and tax-free property with cost allocations according to its own devising are all that were necessary to make a project successful. Current news reports would indicate that the government can no more turn back the laws of engineering and economics than King Canute could turn back the tides of the sea.

While these facts may cause members of the electrical industry to wag their heads and say "I told you so," there can be little satisfaction gained unless some way can be found to help remove the temptations for government to further experiment in the field of power. It is possible that as a result of the TVA investigation and of the situation in Nebraska, Texas and the Northwest Congress may be loath to authorize any new experiments. But what of the projects already under way? To secure an immediate market they must either engage in wasteful competition with private industry or further add to their excessive cost by the purchase of existing utilities. But neither assures the requisite market.

The answer would seem to lie, as ELECTRICAL WORLD has consistently maintained, in a co-operative undertaking between privately owned utilities and the government whereby the former will help the latter to market this power. So long as the power is unmarketed it will present a constant opportunity for unwise experimentation.

It is immaterial that these plants have no economic necessity; it is immaterial that there is no immediate market. The fact is that the plants either are here or are being built. Some one must absorb the output. Private capital will suffer less and the public will pay less in the long run if this power finds its market through normal commercial channels, stimulated by incentive.

There is no question but what the government power projects are in trouble and that the public is beginning to realize that the promises made are not going to be flulfilled. Private industry can do the country a tremendous service by helping the government make the best out of a bad situation.

Flexible Distribution Aid to Aircraft Plant Production

By ARTHUR G. LLOYD

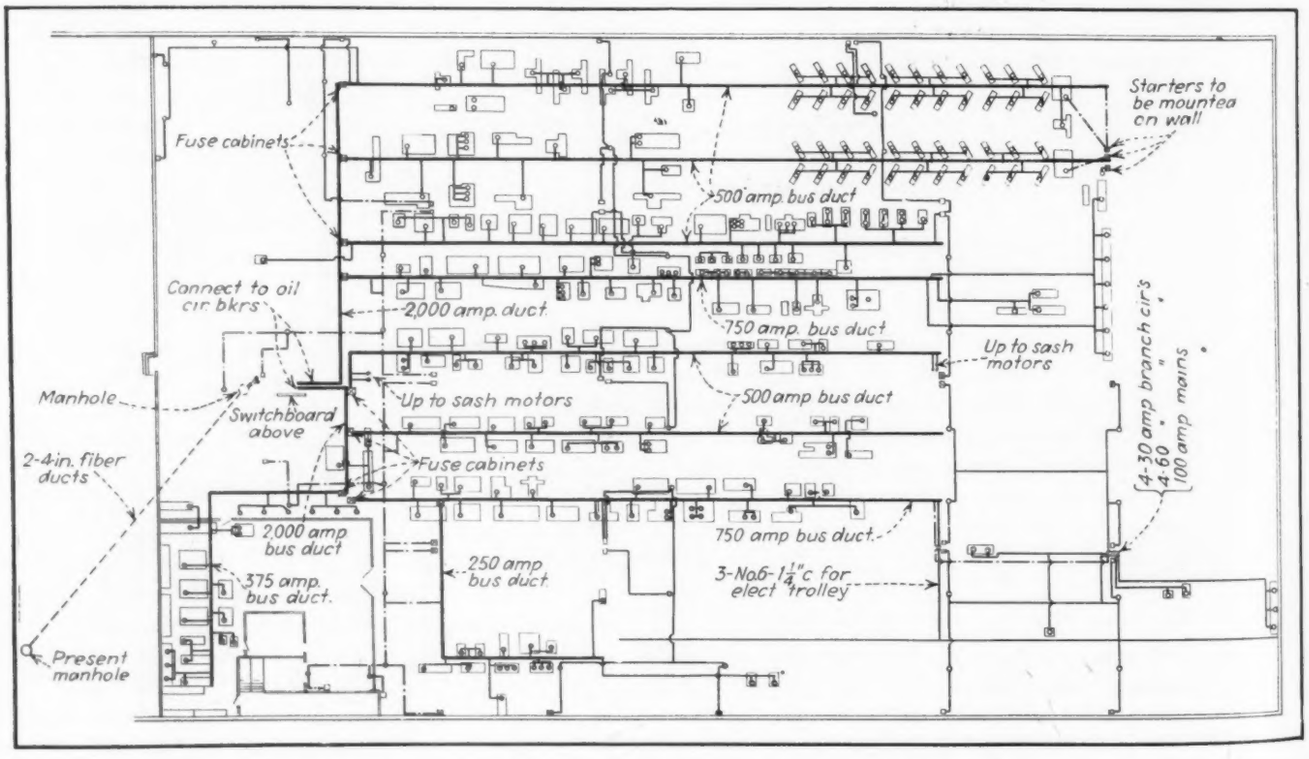
Production Engineer Hamilton Standard Propellers, Division of United Aircraft Corporation, East Hartford, Conn.

Main "Buss-Wa" serves seven "Flex-a-Power" feeders to the left and one to the right

Aluminum inclosures specified. Vertical supports at not less than 5-ft. spacing. The transformers are on the roof over the stairway at the left. The fused junction boxes are mounted below the bus runs which are attached to the underside of the roof trusses.

FORMERLY the Hamilton Standard propellers were produced in the plant of Pratt & Whitney Aircraft, but increase in output demanded a distinct production area. When the new building had been decided upon one of the early questions was that of providing an electrical distribution scheme in keeping with modern production requirements. Analysis and examination of current practice converged the decision upon a continuous bus system because it best met the requirement for a high degree of flexibility.

Such flexibility has proven necessary in many automotive establishments, but they at least afford the opportunity for the stability in machine layout that attends a policy of yearly models. The aircraft industry is in a continuous state of flux and the procession of designs calls for the utmost in production flexibility. New features in propeller design for both civil transport and military aviation



400 Machines served by 2,000-amp. main bus and eight "Flex-a-Power" feeders

call for special machines which have to be fitted with least disruption into the pattern of productive plant layout.

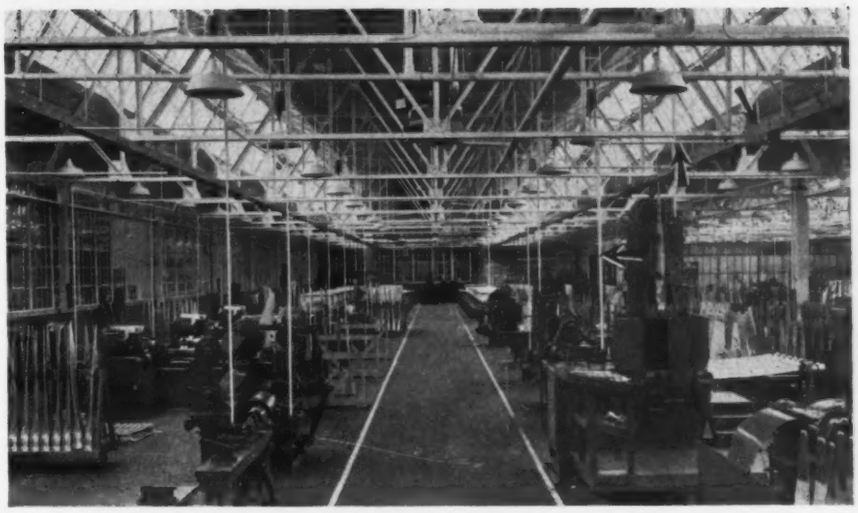
In this field another requirement is the high degree of quality and reliability of the product, which must be maintained to meet the needs of the public in both safety of travel and national security. The machines used differ from those in many industrial plants in that they have to be of isolated types to establish and finish the warped surfaces that are characteristic of airplane propellers.

Taking these requirements fully into consideration, the architects and engineers (Albert Kahn, Inc., Detroit) were instructed to provide a system of electrical distribution which would permit installing a machine anywhere at any time with the minimum of delay and minimum of rearrangement of the wiring. The system selected and installed is the Trumbull "Flex-a-Power" feeder distribution system along the machine aisles tapped at right angles from a "Buss-Wa" which runs across one end of the plant. There are seven of these production aisle bus-lines, all 220 volts, three phase.

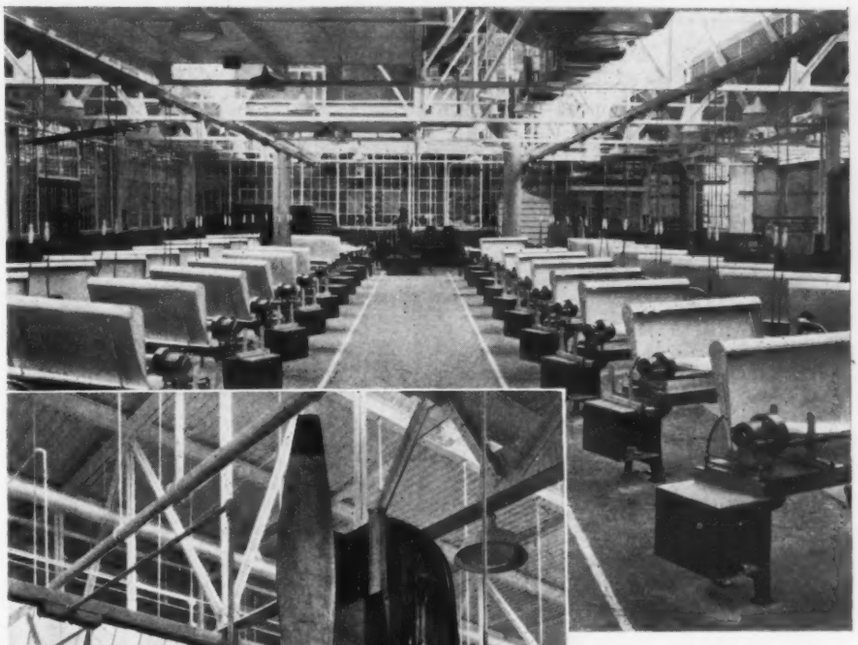
A significant index of the ease with which machines can be moved and be back in operation and production is the fact that it took on the average only three-fourths of an hour to connect up each machine when the whole plant was moved from its former location to the newly erected building. Application of the coupling boxes 20 in. apart affords this flexibility. When a machine is moved the conduit is moved with the machine; the vertical portion is always the same even if some slight change has to be made in the horizontal portion at the new machine location.

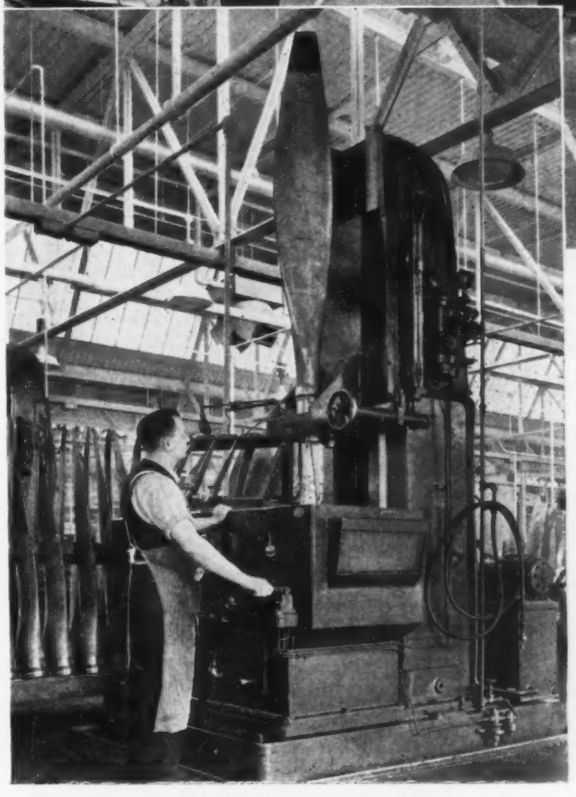
In the earlier set-up, which was not wholly such a decentralized method of distribution, it was often necessary to run new lines some distance back to a distribution center. Some interruptions had also been experienced from blown fuses and wiring defects. There have been no interruptions due to the "Flex-a-Power" or "Buss-Wa" system since the installation was made late in 1936. In fact, some of the junction cabinets have never had to be opened since they were installed. Maintenance costs have correspondingly been negligible.

The plant embraces some 400 ma-



Machining line for the forged propeller blades—Plug openings are provided at 20-in. intervals





Tapered hole is bored in blade shank

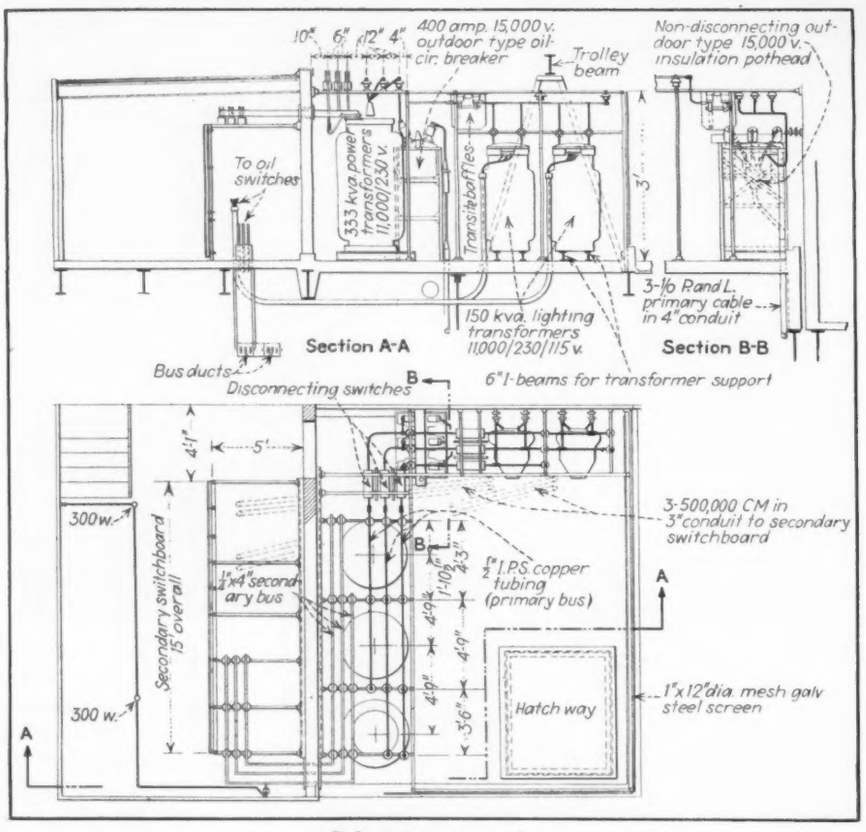
This shows clearly neat manner in which machine is served by conduit from "Flex-a-Plug" attached conveniently at any point in "Flex-a-Power" run.

Battery of about 50 grinding and polishing benches, each with dust collector

Each is fed from a type FS FD FE plug with 30 amp. rating. Breaking of the circuit when opening or closing the plugs does not occur on the Flex-a-Power bus because of provision of auxiliary break contacts within the plug. All parts are dead when the switch is open. Fuses are accessible only after the plug has been swung on its hinges to the disconnected position.

Another battery of smaller grinders is served through flexible leads to hand-operated tools.

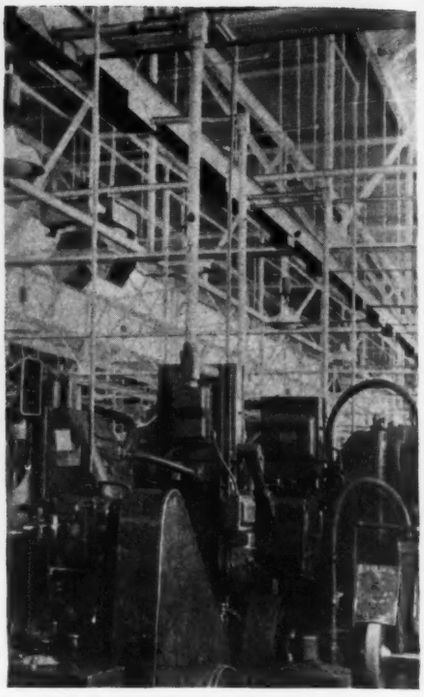
Both two- and three-way propeller hub barrels move down these lines for machining. Motors are served from 750 and 500-amp. "Flex-a-Power" runs



Substation on roof

Primary power is derived at 11 kv. by cable under the Connecticut River from the South Meadows plant of the Hartford Electric Light Company and transformed to 230 volts for application to the bus distribution scheme.

Transformer cases and pipe racks for bus structures grounded with 1/8 x 1-in. strap copper.



Relatively heavy powered grinders also served from same distribution

These three Blanchard grinders are each powered with two motors rated at 25 (or 40) hp. and 2 hp. respectively.

chines involving about 500 motors. Of these 176 have been added in the last six months. Over the whole year and a half the new machines have been added at the rate of about one per week, a figure which gives some index of the flexibility that is required of the electrical supply system serving them. In addition there has been an almost continuous program of relocation of existing machines to permit the installation of the newly acquired ones and to keep the whole production régime on a high plane of efficiency. The plant operates 24 hours a day to keep up with demands.

Installation was figured on actual load amounting to 80 per cent of the connected load, which has now risen to about 1,250 kw. The approximate cost was $83,080. For comparative purposes this amounts to about $37.95 per foot of combined "Buss-Wa" and "Flex-a-Power," to $245.79 per outlet at a machine and to $37.82 per connected horsepower.

The installation described has the further advantages of being a prefabricated product with relatively small installation disturbance and cost. It affords 14-ft. clearance in the aisles. No drop lights have been found necessary, although in the prior location it was found necessary to install many of them.

As for carrying capacity, there is no limitation as to bunching of the loads so long as the current-carrying capacity of the "Flex-a-Power" run is adequate for the total load it serves. It is thus immaterial whether a new machine or group of machines is installed 50 ft. or 150 ft. from the junction with the "Buss-Wa" feeder. For a time there was some skepticism about temporary overheating on the part of those who had been more familiar with the older forms of industrial plant distribution, but measurements showed there was no basis for concern on this score.

Cost Comparison—
Protector Tubes vs. Ground Wires

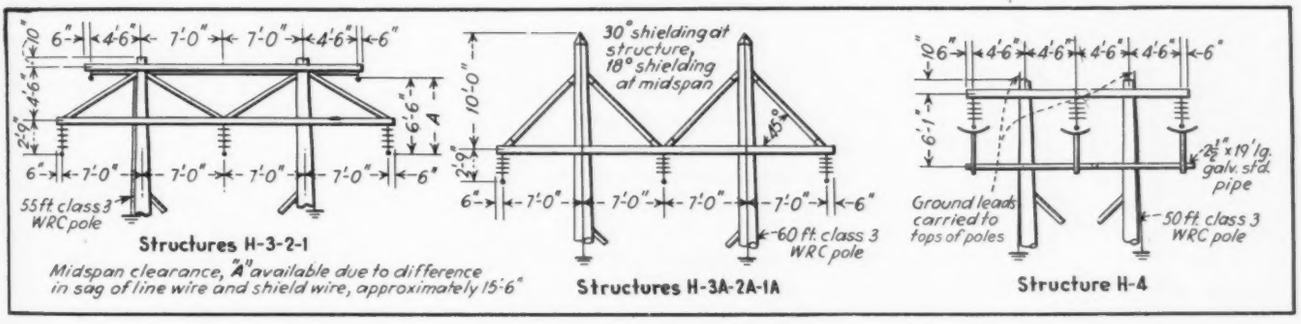
By E. P. NANEY

*Construction Engineer Interstate Power Company, Dubuque, Iowa**

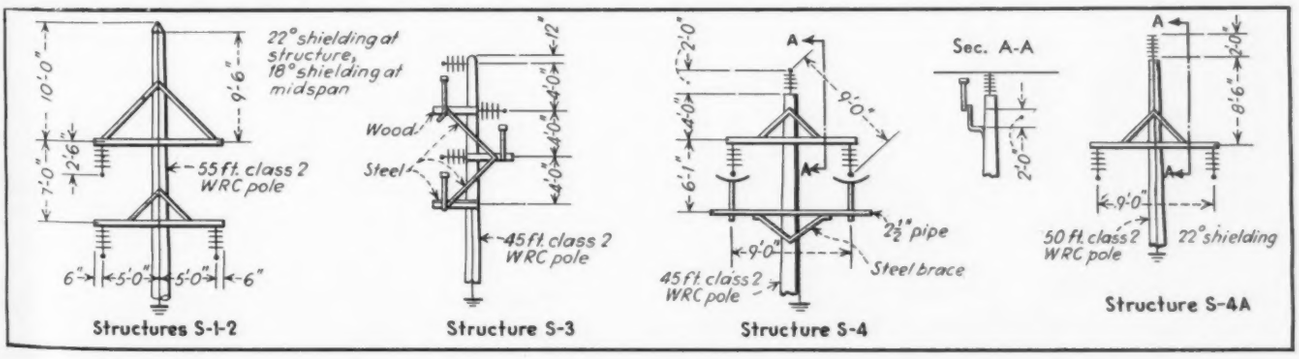
NOW in service are a considerable number of 66-kv. lines that were installed without ground wires and without adequate insulation or space for them. It is the writer's opinion that the use of protective tubes is the most economical method of decreasing interruptions from lightning trip-outs on such lines. The Interstate Power Company constructed a 66-kv. steel tower line in 1926. Insulation value was not what would now be considered desirable and design of the tower was such that the addition of suspension insulators was limited by tower clearances. Protector tubes offered a solution to the problem of lightning interruptions and were installed in 1932. In the six years' operation before the tubes were installed there were 277 interruptions that could be traced to lightning. This is an average of 46 interruptions per year on a line 53.25 miles long, or approximately at the rate of 87 trip-outs per 100 miles per year. In the six years following the protector installations the total trip-outs from lightning were sixteen, or an average of 3.1 per year. Included in this total are eight trip-outs in the one year 1936.

Analysis indicated that the increase in 1936 resulted from a change in operation of plants. The short-circuit current on the line had been reduced such that the recovery voltage strength of the protector tubes in the south section was lower than on the system. The protectors in this section were changed to correct the condition and the outages were reduced to two in the twelve months succeeding the change.

* Adapted from paper to Engineering Conference, Missouri Valley Electric Association.


6" 4'-6" 7'-0" 7'-0" 4'-6" 6"
10'-0"
4'-6"
2'-9"
6'-6"
A
6" 7'-0" 7'-0" 7'-0" 7'-0" 6"
55 ft. class 3 WRC pole
Structures H-3-2-1
Midspan clearance, "A" available due to difference in sag of line wire and shield wire, approximately 15'-6"
30° shielding at structure, 18° shielding at midspan
10'-0"
2'-9"
45°
6" 7'-0" 7'-0" 7'-0" 7'-0" 6"
60 ft. class 3 WRC pole
Structures H-3A-2A-1A
10" 6" 4'-6" 4'-6" 4'-6" 4'-6" 6"
6'-1"
2½" x 19' lg. galv. std. pipe
Ground leads carried to tops of poles
50 ft. class 3 WRC pole
Structure H-4

Above sketches represent seven structures compared as to cost in Table I. Structures H-3, H-2 and H-1 are identical except that horizontal dimensions of H-2 and H-1 are successively one foot less than those of H-3 which are given on the sketch. The shielding angles of the ground wires, 2 ft. 6 in. inside the outer conductors, are the same in all three cases. Structures H-3A, H-2A and H-1A also are identical in dimension except for the same differences as to H-2A and H-1A; i.e., horizontal dimensions successively 1 ft. less than those shown for H-3A. The shielding angles of the narrower structures are less, being 26 deg. at structure, 15 deg. at midspan and 22 deg. at structure, 13 deg. at midspan respectively for H-2A and H-1A. These six structures employing ground wires are compared with structure H-4, on which protector tubes are used. It is to be noted that H-4 uses shorter crossarms and poles than the others, an important contribution to its lower cost.



Above sketches represent five variants of single-pole construction. S-2 is identical with S-1 except that vertical dimensions above top arm are decreased 4 ft., requiring a 50-ft. pole and flattening the shielding angles to 30 deg. at structure and 24 deg. at midspan. Structure S-3 uses "line post" insulators in horizontal position on the pole. The cost of S-3 is the same as for S-4, which is probably the most satisfactory type of single-pole structure fully equipped with protector tubes. The "line post" insulator holding the top conductor requires at least 2 ft. of the wood insulation of the pole between it and the ground lead for functioning of the protector tube. Structure S-4A is a simplification of S-4, using a protector tube only on the top conductor. This design assumes that with the tube the top conductor performs the double duty of line conductor and ground wire. This structure combines good operating characteristics with low cost.

Types of structures compared

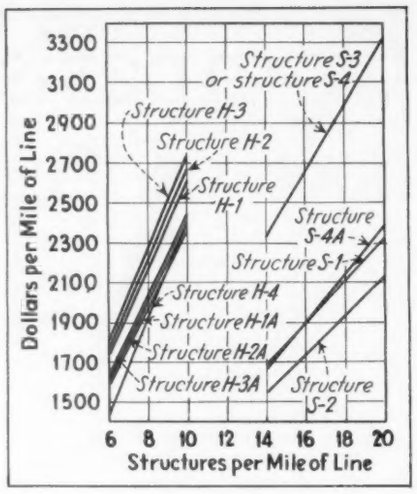
It is on this record that the writer feels justified in the following comparison in using two outages per 100 miles per year as the expected performance of a line equipped with protector tubes. Tube failures on this line average about two per year. The two most recent were inspected. In one case a section exploded out of the side of the tube. In the other case the tube split. Neither caused an outage.

The performance of this line, for which protector tubes had offered the only means of improvement, has been so good that naturally the tubes suggest themselves as components in initial design as against the use of ground wires in future 66-kv. construction. Studies were made of the costs of the two methods of protection and the results are summarized here. Acknowledgment for assistance in the studies is made to A. C. Monteith, Westinghouse Electric & Manufacturing Company, and to Hughes Brothers, Seward, Neb., also to both the General Electric and Westinghouse companies for various published data on line protection and design.

In order for a general cost comparison to be made, certain definite assumptions are necessary.

It is assumed that for practical purposes structures with ground wire or wires and with protector tubes are approximately equal in mechanical factors of safety; that 2⅜-in. high-strength stranded steel conductor is suitable for use as ground wires

(Continued on page 110)



Costs per mile of line
These costs do not include energy conductors, but do include shielding wires where used.

Table I—Installed Costs of 66-Kv. H-Frame Transmission Line Structures With Shield Wires and With Protector Tubes

	Unit Matl. Cost	Unit Lbr. Cost	Structure H-1		Structure H-2		Structure H-3		Structure H-4		Structure H-1A		Structure H-2A		Structure H-3A	
			Q.	Cost	Q.	Cost	Q.	Cost	Q.	Cost	Q.	Cost	Q.	Cost	Q.	Cost
Dbl. 3½ x 7½-in arm	As shown		1	$21.43	1	$23.33	1	$25.23	1	$20.51	1	$21.43	1	$23.33	1	$25.23
for line wire	As shown		1	3.67	1	3.87	1	4.07	1	3.67	1	3.67	1	3.87	1	4.07
Dbl. 3½ x 7½ srm.	As shown		1	14.99	1	16.74	1	18.54	..	.....	..	.....	..	.....	..	.....
for shield wire	As shown		..	2.67	..	2.67	..	2.67	..	.....	..	.....	..	.....	..	.....
Ridge iron complete	$1.435	$0.60	..	.....	..	.....	..	.....	..	.....	2	4.07	2	4.07	2	4.07
"X" brace complete	As shn.	2.67	1	13.72	1	14.57	1	16.27	1	13.30	1	13.72	1	14.57	1	16.27
Knee brace complete	3.50	0.67	4	16.68	4	16.68	4	16.68	..	.....	..	.....	..	.....	..	.....
50-ft. Class 3 WRC poles	21.70	6.00	..	.....	..	.....	..	.....	2	55.40	..	.....	..	.....	..	.....
55-ft. Class 3 WRC poles	24.85	6.50	2	62.70	2	62.70	2	62.70	..	.....	..	.....	..	.....	..	.....
60-ft. Class 3 WRC poles	28.10	7.00	..	.....	..	.....	..	.....	..	.....	2	70.20	2	70.20	2	70.20
⅝-in. x 20-ft. ground comp	7.00	1.52	2	17.04	2	17.04	2	17.04	2	17.04	2	17.04	2	17.04	2	17.04
2-in. x 19-ft. galv. pipe mtg for tubes complete	5.50	1.48	..	.....	..	.....	..	.....	1	6.98	..	.....	..	.....	..	.....
66-kv. protector tubes	19.00	0.74	..	.....	..	.....	..	.....	3	59.22	..	.....	..	.....	..	.....
Insl. strings (4 insls.)	9.74	0.16	3	29.70	3	29.70	3	29.70	3	29.70	3	29.70	3	29.70	3	29.70
Shield wire susp. cl	1.72	0.15	2	3.74	2	3.74	2	3.74	..	.....	2	3.74	2	3.74	2	3.74
Total material & labor				$186.34		$191.04		$196.64		$205.82		$163.57		$166.52		$170.32
*Insurance, tools & transportation				9.00		9.00		9.00		9.00		9.00		9.00		9.00
Total direct costs				$195.34		$200.04		$205.64		$213.82		$172.57		$175.52		$179.32
Engr. & supt. 12 per cent of direct cost				23.44		24.00		24.68		25.66		20.71		21.06		21.52
Total installed cost per structure				$218.78		$224.04		$230.32		$239.48		$193.28		$196.58		$200.84

* Approximately 30 per cent of labor.

Table II—Installed Cost of 66-Kv. Single-Pole Structures With Shield Wires and With Protector Tubes

	Unit Matl. Cost	Unit Lbr. Cost	Structure S-1		Structure S-2		Structure S-3		Structure S-4		Structure S-4A	
			Quan.	Cost	Quan.	Cost	Quan.	Cost	Quan.	Cost	Quan.	Cost
45-ft. Class 2 pole	$21.05	$6.00	.....	.....	.....	.....	1	$27.05	1	$27.05	.....	.....
50-ft. Class 2 pole	24.70	6.00	.....	.....	1	$30.70	.....	.....	.....	.....	1	$30.70
55-ft. Class 2 pole	28.20	6.50	1	$34.70	.....	.....	.....	.....	.....	.....	.....	.....
Type S-2 pole head	11.92	2.10	.....	.....	1	14.02	.....	.....	.....	.....	.....	.....
Insulator strings	9.74	0.16	3	29.70	3	29.70	.....	.....	2	19.80	2	19.80
Type S-1 pole head	16.32	2.10	1	18.42	.....	.....	.....	.....	.....	.....	.....	.....
Shield wire clamps	1.77	0.15	1	1.92	1	1.92	.....	.....	.....	.....	.....	.....
20-ft. ground compl	7.00	1.52	1	8.52	1	8.52	1	8.52	1	8.52	1	8.52
Lapp line pst. insls	12.22	0.32	.....	.....	.....	.....	3	37.62	1	12.54	1	12.54
Protector tubes	19.00	0.74	.....	.....	.....	.....	3	59.22	3	59.22	1	19.74
Tube suppts.—sing	3.00	1.00	.....	.....	.....	.....	3	12.00	1	4.00	1	4.00
Tube suppts.—dbl	4.00	1.35	.....	.....	.....	.....	.....	.....	1	5.35	.....	.....
Type S-4 pole head	6.53	1.35	.....	.....	.....	.....	.....	.....	1	7.88	1	7.88
Total material and labor				$93.26		$84.86		$144.41		$144.36		$103.18
*Insurance, tools & transportation				3.23		3.08		4.11		4.08		3.24
Total direct costs				$96.49		$87.94		$148.52		$148.44		$106.42
Engr. & supt. 12 per cent of direct cost				11.58		10.56		17.82		17.81		12.77
Total installed cost				$108.07		$98.50		$166.34		$166.25		$119.19

* 30 per cent of labor.

Kitchen Plans Sell Major Appliances

Latest Field Reports Emphasize Use of Selling Tool Placing 1.6 to 2.2 Appliances per Plan

In two short years the national Modern Kitchen Bureau Program has become one of the most widely accepted in the industry, with all four branches co-operating actively in bringing complete electric service to the home.

Out of the current experiences of a large number of active local bureaus the following reports are presented through the co-operation of the national bureau to indicate the vigorous participation of utility companies and their effective use of the kitchen plan for selling major appliances in the highly important domestic field.

Tennessee Sells 2.2 Appliances per Plan

By E. W. ASHMEAD
Manager of Sales Tennessee Electric Power Company, Chattanooga, Tenn.

IN OCTOBER, 1937, the promotion throughout the territory of this company was broadened to cover not only kitchen planning but also adequate wiring, lighting, all-electric appliances and "inside weather control"—a complete Home-Planning Service. Fifteen home-planning advisers are now located at the various points throughout the territory, contacting home owners, architects, contractors, electrical dealers and others connected with building and remodeling.

Since the beginning of this activity 1,050 prospects have been contacted, 516 kitchens have been planned and 367 homes have been completed and occupied during this same period. In these 367 completed residences 182 "modern electric kitchens" were planned by our advisers. These 182 planned homes have installed a total of 408 major appliances, of which 190 were new sales, eleven were replacements and 207 were moved in by the tenants, making an average of 2.2 appliances per planned kitchen.

This service has been of particular interest to speculative builders, due largely to the success which one builder has had in carrying out the recommendations which were made to him. This builder completely electrified a new $4,000 home—and advertised it. The day it was opened to the public there were 500 visitors, and the "completely electric" home was sold on the day it was opened. Only two blocks away another builder put on display a home slightly more expensive in cost and at a better location, but lacking the electrical conveniences, which received approximately 100 visitors on the day it was opened, and which was not sold for more than eight months after its completion.

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Pennsylvania Sells $78,000 from Plans

By J. M. STEDMAN
Manager Residential Sales Pennsylvania Power & Light Company, Allentown, Pa.

OUR experience and that of local appliance retailers, as reported in the use of the modern kitchen approach to increase merchandise sales, has been favorable in every way.

Kitchen planning service is offered by the Pennsylvania Power & Light Company to all co-operating retailers and company representatives. Presentation of the modern kitchen is best made through the avenue of the personalized kitchen plan. Customers not interested in the purchase of individual appliances become interested when these same appliances are incorporated as a part of this complete plan to attain better living.

All company representatives are trained in the use of this service, the presentation and closing of the sale, either on the step-by-step basis or as a complete unit.

In the first fifteen months of operation 441 kitchen plans were prepared. Reports received to date on 434 of these plans reveal all but 32 as remaining active. Latest reports on 248 plans show sales of 408 appliances with a total dollar volume of $77,897.19. This is equivalent to 1.65 appliances per plan and an average dollar volume of $314.10 per plan. With only partial reports available on the sale of contemporary equipment and appliances furnished by sources other than the company a total of $101,495.62 worth of business has been reported.

To obtain complete co-operation all appliance retailers, distributors

ENSEMBLES FOR NEW HOMES—Texas Power & Light Company salesman and layout man prepare ensemble selling plan for all-electric kitchens

and jobbers of contemporary kitchen equipment have been solicited. Architects, builders and contractors are contacted continuously.

To assure continued and increased public acceptance many promotional ads featuring the modern kitchen have been scheduled in more than 100 newspapers serving the territory of the Pennsylvania Power & Light Company. Promotion materials, programs and contacts by representatives of the national bureau have been of help. The 1938 program of the Modern Kitchen Bureau, featuring specific services yet providing a close tie-in with the over-all job of promoting the complete kitchen, has been used in our spring activities with a fair measure of success.

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Spokane Bureau Turns Out Two Plans Daily

By LEWIS W. LEWIS

General Sales Manager
Washington Water Power Company, Spokane

WITHOUT question, one of the most effective promotions of our company in stimulating the sale of electric ranges, water heaters, refrigerators and in building a better appreciation of the company's services on the part of the general public has been that of the modern all-electric, step-saving kitchen.

First step in the program was the organization of the Spokane Step-Saving Kitchen Bureau. This was accomplished through and as a part of the Better Housing Committee of the Spokane Chamber of Commerce in co-operation with the Federal Housing Administration. Headquarters was set up in a central Spokane location, including, in addition to office space, a model demonstration kitchen and drafting room. Display of electrical equipment in the demonstration kitchen is rotated among co-operating interests.

An important step in the development of the program was the establishment of demonstration kitchens throughout the territory. Eleven such kitchens have been installed in Spokane. In larger centers outside of Spokane at least one demonstration kitchen has been installed. These have attracted wide public interest, demonstrate the step-saving principle of design and are of material assistance in the sale of equipment.

From January, 1937, to June, 1938, a total of 745 all-electric kitchens have been planned. At the present time the bureau is turning out about two kitchens per day. A follow-up check on the service showed that 43.8 per cent of the kitchens planned have been completed, 44.2 per cent are in work or will be completed at an early date, while 12 per cent have not yet been started.

In the completed kitchens an average of two major electrical devices, a ventilating fan, an electric range, electric refrigerator or electric water heater have been sold per kitchen. And this average shows every indication of increasing as time goes on.

It has been the experience of our salespeople that once the customer has made a start on a planned step-saving kitchen it is an easy matter as the customer completes payment on one major appliance to add other electric services to the kitchen.

Each Portland Plan Produces 11.5 Kw.

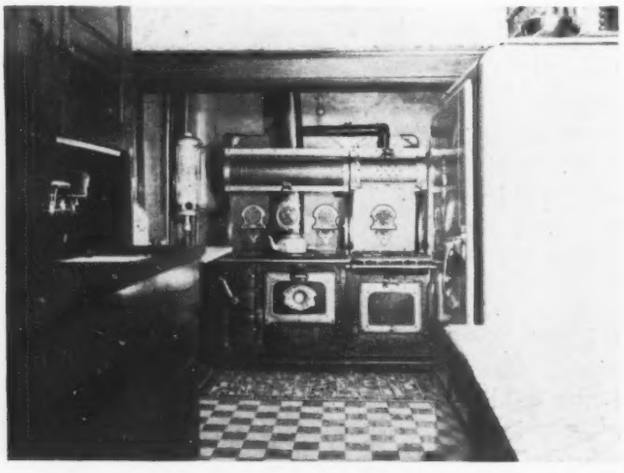
By A. C. McMICKEN

General Sales Manager, Portland General Electric Company, Portland, Ore.

IN ADDITION to floor and wall plans, we have prepared perspective drawings in colors which we found very valuable in enabling our customers to visualize how modernized kitchens would appear.

At first, requests for modernizing plans came only through supervisors of groups of range salesmen, but the salesmen soon learned that ensemble selling was greatly aided by telling the story of time and effort saved and enjoyment obtained through properly planned kitchens. During the two-year period from May 1, 1936, to May 1, 1938, we have prepared a total of 1,559 kitchen plans, of which approximately 60 per cent were prepared for new residences and approximately 40 per cent were for customers desiring to remodel and modernize their kitchens. Of this number of kitchen plans prepared nearly 85 per cent have been carried to completion with an average load increase of $1\frac{3}{4}$ major appliances per plan. These have an average installed capacity of 11.5 kw.

Probably the greatest value to date from this kitchen planning service has been its influence on the design and construction and equipment of kitchens in new homes throughout the territory. Architects, speculative builders and home owners more fully appreciate that planned kitchens save steps, are more pleasant places in which to work and may be shown



IN THIS KITCHEN Pennsylvania Power & Light has used the refrigerator as step No. 1 in achieving a complete electric kitchen

to friends and guests with the same pleasure that other rooms in the house are shown.

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Boston Averages 1.6 Appliances per Plan

By HENRY B. KANE

Kitchen Modernizing Service, Boston Edison Company, Boston, Mass.

FOR almost two years we have been actively engaged in the promotion of the all-electric kitchen. Two men devote all their time to this activity, working in conjunction with our own salesmen, builders, architects and dealers. They make surveys, prepare plans and written recommendations, present them to the customers and assist the salesmen in making the actual sales.

The results to date have been most satisfactory. Fifty-five per cent have resulted in the sale of major appliances, averaging 1.6 units per plan. The high percentage is due to the fact that salesmen seldom request a plan unless the prospect has shown an active interest. The average indicates that most of the sales have been on the so-called "step" basis, rather than complete kitchens. This is inevitably true where the major portion of the plans are made for remodeling existing kitchens, not for those in new homes.

The Boston Edison Company merchandises electrical equipment. We offer an advisory planning service, a selection of various makes of electrical equipment and information on sources for the remainder of the kitchen materials.

Connecticut Using 1,000 Plans per Year

By A. M. WADE

Connecticut Light & Power Company, Hartford, Conn.

HOW best to capitalize and further promote the trend toward the modernizing of kitchens so as to benefit directly our customers, our company and our co-operating dealers constitutes a problem which we have been seeking the best solution for since early 1936. We have almost entirely eliminated the colored perspective drawings through the use of (1) a rough floor sketch of the present kitchen; (2) a floor sketch of the suggested new kitchen; (3) miniature kitchen blocks; (4) a blueprint showing floor plan and elevation.

Each of our larger offices has a trained kitchen planning specialist whose job it is to train and assist our salesmen in the kitchen planning approach to sales and to work with co-operating dealers, architects, builders, etc. Much of the unproductive detail work involving cabinets, linoleum and other non-electric kitchen equipment has been eliminated in our present scheme of operation. Our efforts are now concentrated on the correct location of each appliance sold in relation to the three work centers involved in a modern kitchen.

When we have sold an appliance and located it to the best advantage, making certain that the kitchen planning story has been told to the customer, our immediate job is done.

Last year we made close to 1,000 kitchen plans for our customers. Our merchandise business was the largest in the company's history. While only a comparatively small amount of the total business was directly attributed to the kitchen planning activity, it is safe to say that many sales resulted indirectly from the kitchen planning advertising and the work done by the kitchen planning supervisors. Dealers, too, benefited as a result of the kitchen planning program, selling thousands of dollars' worth of appliances, cabinets, plumbing, linoleum, etc.

We have found and are finding that the kitchen planning program is a vital force in promoting the sale of the dishwasher, disposall and the electric sink, the future for which looms large.

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Georgia Makes Sales From 73% of Plans

By O. M. JACKSON

Merchandise Manager Georgia Power Company, Atlanta

RECOGNIZING the advantages to be gained by promoting the trend toward ensemble selling, we began in 1937 an activity involving the home service, merchandise sales and advertising departments of our company.

We have a thoroughly trained home service staff, well distributed over our entire territory. It is the responsibility of the home economists to render planning service at the request of salesmen or customers

[*Continued on page 111*]

A STUDY IN EXTREMES — The same kitchen, before and after modernization. Boston Edison kitchen specialists have dubbed the former "Early American." Both photographs were taken from the same spot

Transmission at 230 Kv. Built at $10,300 per Mile

By ROBERT N. ALLEN

Transmission Line Engineer, The Metropolitan Water District of Southern California

NOTABLY different from factors affecting the design of transmission lines supplying industry, lighting and general public use were those encountered by the Metropolitan Water District of Southern California in providing a power supply for its Colorado River Aqueduct pumping plants. Soon to be ready for service is the 237-mile, single-circuit, three-phase, 230-kv. transmission line from Boulder power house to the pumping plants known as Gene, Iron Mountain, Eagle Mountain and Hayfield.

Careful planning, complete specifications with coverage of all construction items and use of a small, efficient personnel during surveys and construction have combined with the low material and construction costs prevailing when bids were received in 1935 to keep the cost of this line well below that usual for this type of construction.

Major contracts for materials and construction were as follows:

Contractor	Feature	Contract Payments
Newberry Electric Corp.	Telephone line	$71,000
Bennett & Taylor	Patrol roads	75,000
Fritz Ziebarth	Line construction	449,000
Pacific Coast Steel Corp.	Steel towers	431,000
Aluminum Co. of America	Alum. conductor	627,000
Anaconda Wire & Cable Co.	Copper conductor	43,000
Graybar Electric Co. Ltd.	Suspension insulators	92,000

Entire cost of the 237 miles of 230-kv. line, 2.2 miles of 69-kv. line (from Gene terminal to intake pumping plant), the mid-line switching station at Camino, with six patrolmen's cottages, ten-car garage, two warehouses, a shop and gas and water systems, some 235 miles of patrol road and 137 miles of telephone line will be less than $2,440,000. This includes surveys, mapping, right-of-way, design, materials, construction and field and general office overhead. This is approximately $10,300 per 230-kv. transmission line mile, an extremely low figure for this type of construction.

Switch racks at Boulder and at each pumping plant are not included in transmission line costs.

The transmission line is designed to operate successfully with something more than 50 per cent of the ultimate load of 310,000 kw. required for operating pumps at full development. Sufficient right-of-way was obtained to permit the construction of a second line from Boulder to Hayfield when required.

The aqueduct line will supply power for the Metropolitan Water District alone, and except for incidental station and camp services at the pumping plants all power will be used to drive synchronous pump motors.

An outage of the pumps at Intake, Gene and Hayfield will cause no loss of water as there is sufficient natural reservoir capacity

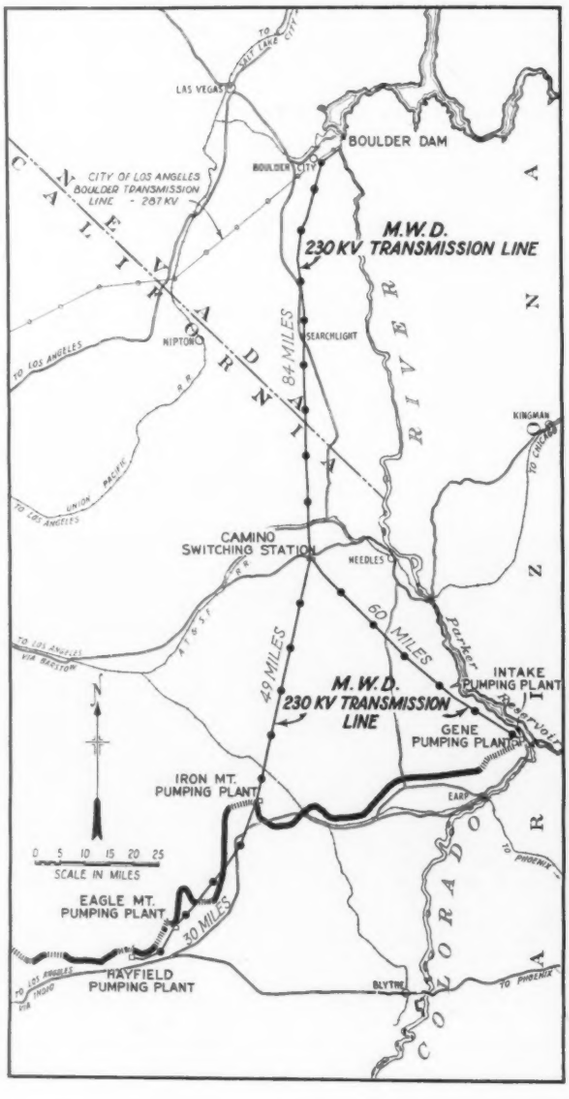


Fig. 1 — Desert area, storms in winter, violent thunderstorms or cloudbursts in summer

Arid, annual rainfall 2 to 10 in. Daily range of temperature often exceeds 30 deg., summer temperatures occasionally reach 130 deg. F., and short periods of below freezing weather sometimes occur in winter, the higher altitudes receiving some snow.

The northern 100 miles lie between 2,100 and 3,000-ft. elevations except for 17 miles in the vicinity of Searchlight, Nev., in which maximum is 3,700 ft. Five miles of this section, lying above 3,500 ft., has been classed as heavy loading. Heavy towers (type A) and reduced tension were used in this section. Heavy towers were also used in a 2½-mile transition section each side of this heavy loading section. The remainder of the line to Hayfield lies generally between a low of 700-ft. elevation on the Dry Lake and 1,600 and 2,000 ft. reached at Granite Pass and Coxcomb Pass, respectively. The line between Camino switching station and Gene lies between 1,700 and 2,300-ft. elevations for the first 32 miles, then drops to a low of 800. The remaining 28 miles lies between 800 and 1,300 ft.

to hold any water in transit in the aqueduct. Small reservoirs have been constructed at Iron Mountain and Eagle Mountain plants to assist in pump regulation and to provide storage during outages up to 40 minutes at ultimate capacity.

Longer outages, or outages occurring with partly filled reservoirs, will require the spilling of water at these two plants, or at specially constructed wasteways along the line. Because of the large water storage in the terminal reservoir at Cajalco, near Riverside, a power interruption will not affect the continuous flow of water through the distribution lines to the member cities. Pumps and aqueduct are so designed that 93.5 per cent operating time, at ultimate development, will utilize the allotted 1,500 sec.-ft. of Colorado River water.

With this type of service in mind, the designers planned a substantially constructed line to give nearly continuous service without the necessity of duplication to insure 100 per cent service. For this reason the expense of ground wires and buried counterpoise was not considered justified, except adjacent to pumping plants. Towers were so designed as to permit the addition of overhead ground wire brackets if such should appear justified by operating difficulties.

The last 20 miles of the Gene line is located in the Whipple Mountains, a very inaccessible and rugged region practically without roads at the time of locating the line. A reconnaissance of this area was made by airplane, and aerial photos (taken on a later flight for mosaic and stereoscopic purposes) were of great service in locating both line and patrol road, which was constructed under contract by Bennett & Taylor before the start of construction of the transmission line.

Following preliminary study of location, control points were determined in mountain passes and elsewhere, and tangents run between these points. Tangents are long—

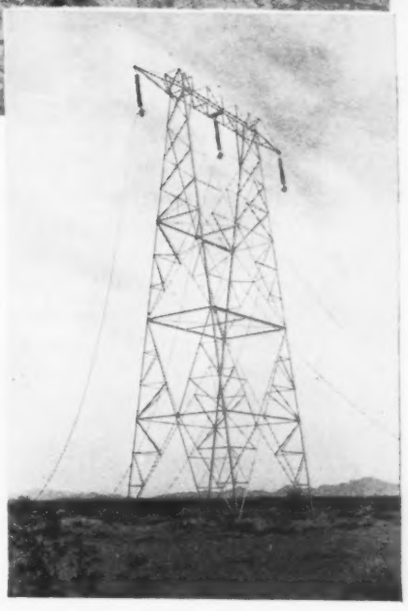


Fig. 2—Stringing aluminum cable

Above—Cable being unreeled from "dollies." Right—Cable in stringing sheaves on "8" type tower.

Three reel lengths, 2¼ miles, usually was the length of pull when tensioning. Three "saggers" with transits mounted on special clamps attached to the towers were used in the sagging operations, head-set portable telephones being employed wherever possible in preference to arm signaling. The cable hanging in the sheaves furnished one-half the telephone circuit and a ground to the tower the other. Although grounds generally existed on both sides of the telephones being used, satisfactory communication was generally obtained where no grounds existed between telephones.

45, 29.5, 17.5, and many over 10 miles in length. Thus angles are few, only twelve being of sufficient magnitude to require dead-end towers. The 25 other dead-ends were required for rack approaches, terminals or tension changes.

Profiles were taken on center line and 25 ft. to right and left (approximately under each wire) and addi-

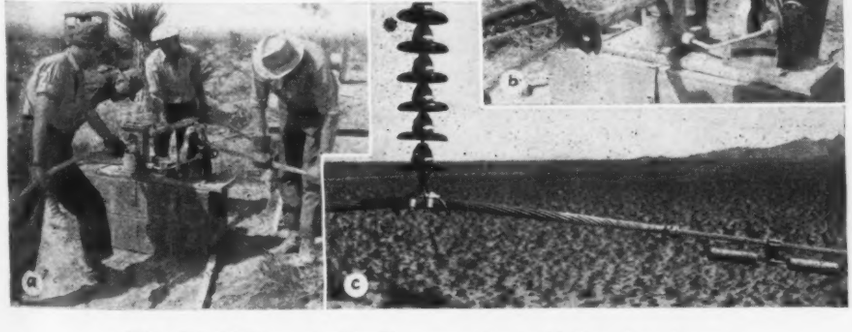


Fig. 3—100-ton hydraulic press for splicing aluminum

(a) The core splice.
(b) The cable splice.
(c) Clamp, armor rods and keeper, Stockbridge vibration damper.

Conductors were spliced and compression dead-end clamps made up by means of the standard 100-ton hydraulic press and splicing sleeves and clamps furnished by the Aluminum Company of America. Standard tapered armor rods, 10 per set, 114 in. long and 0.466 in. in center diameter, were used at the point of attachment of all suspension clamps. Vibration has so nearly been eliminated by the dampers that no spans have yet been discovered where additional dampers are required.

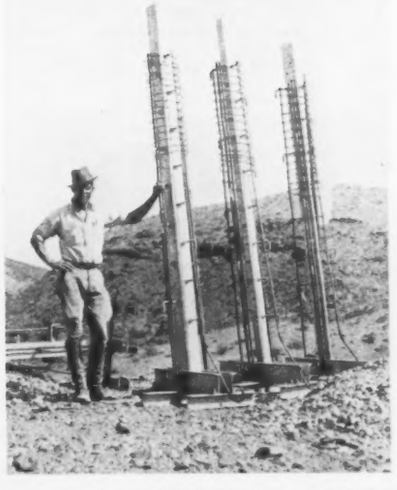


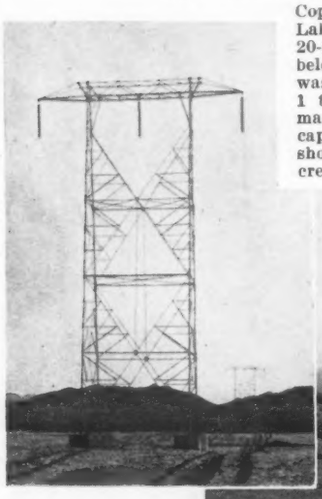
Fig. 4—Assembled footing steel for concrete anchors for type A tower

Concrete footings, used throughout the line (except for one set of rock anchors and 26 sets of pile footings used on Danby Dry Lake), consisted of a steel stub angle attached to a grillage of structural members, the whole incased in concrete. Reinforcement for the concrete envelope was provided by vertical bars spaced around the stub angle, by anchor bolts in the stub angle and by a ¼-in. spiral around the top 3 ft. of footing. Footing steel was assembled at the tower site and the reinforcement steel wired in place. Rock anchors were used only at one point, where hard, massive rock existed. The same stub angle and anchor bolts were used as in a standard footing, this being set in a carefully excavated hole about 14 in. in diameter, 6 to 7 ft. deep in solid rock, then backfilled with concrete.

tional "shots" were taken at points of questionable clearance or where the ground showed an increased slope upward above that shown between center and edge. Three-line profiles were then prepared and tentative tower locations spotted. Except in a few isolated rough spots all profile was taken with a level. Large-scale plane table sheets were prepared for a number of tower sites.

This careful field preparation made it possible to design the line and order material to fit actual conditions, and the accurate profile proved invaluable in checking and avoiding errors when the line was finally staked. All locations were made to permit use of either copper or aluminum conductor. In only one place was it found necessary to make separate locations for the two.

Fig. 5—Completed "H" tower on pile footings



Copper conductor used in this alkali-covered Danby Dry Lake section. Each footing consists of three piles driven to 20-ft. penetration in small-sized pilot holes. At about 1 ft. below ground surface a 1-in. layer of asphaltic mastic was placed around the piles, then a base layer of concrete 1 to 2 ft. thick was poured, followed by a ½-in. layer of mastic. On top of this was placed the reinforced concrete cap, 2 ft. 4 in. thick. Hooks bolted to the piles, and a short footing stub and grillage, were imbedded in the concrete cap.

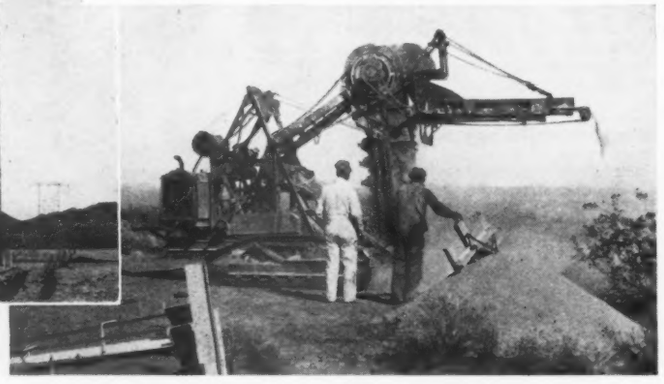


Fig. 6—Barber-Greene excavator dug footing holes

Some 60 miles of footing holes were excavated by a Barber-Greene excavator mounted on a crawler. Practically all other holes were excavated by hand methods. Powder was required on all rock holes and on some of the consolidated gravel holes. Quite often jackhammer rock breakers had to be used on the bottom of otherwise easily dug holes. No soft-bottomed holes were encountered, although in a few cases the upper portions of the hole had to be cribbed.

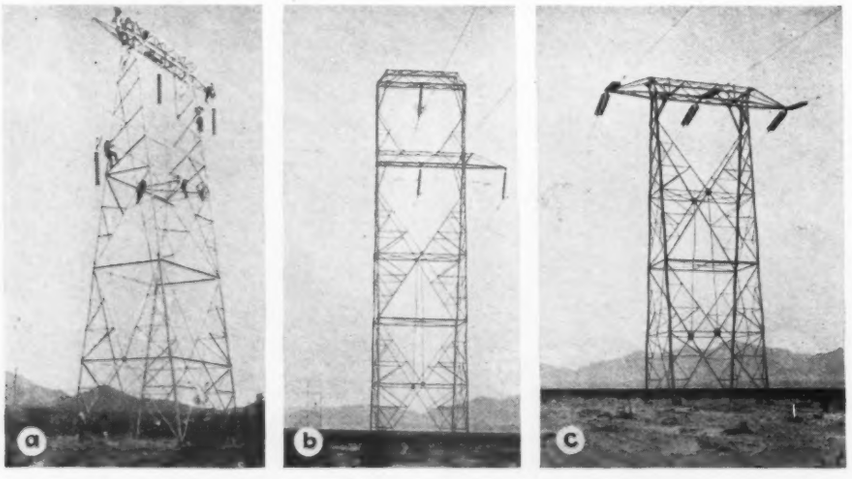


Fig. 7—Provision for standardized extension legs

(a) "A" type tower. Hanging suspensions. (b) Completed type "S" transposition tower. (c) Completed "D" type tower. Jumpers to be placed.

In order to fit the ground with a minimum of excavation S, A and H types were so designed that any combination of standard, 3-ft. longer or shorter or 6-ft. longer or shorter legs could be used on any one tower. S and A types were, in addition, supplied with similarly combined 6, 12, 18 and 24-ft. extensions. D and R types were supplied only with standard, 6-ft. shorter and 6-ft. longer legs. All types were designed for a distance of approximately 72 ft. from ground to conductor, at the tower. Bird guards, consisting of sharply serrated blades stamped from sheet metal, are bolted to the outer ends of all crossarms. Bird pans are used for protection over the center conductor.

Minimum thickness of galvanized steel for tower legs is ½ in., of all other structural steel 3/16 in. The minimum size of the connecting leg of any angle is 1¾ in., all structural members are bolted together with ⅝-in. bolts with special recessed nuts locked on with palnuts. Lengths and threading of bolts is such that no member bears on the threaded portion.

Mostly aluminum, partly copper

Bids showed a decided saving with aluminum conductor. However, 10 miles in the Danby Dry Lake sector, just north of Iron Mountain pumping plant, contained so much alkali and were so subject to swirling desert winds, lifting this alkali and depositing it on insulators, etc., that copper was specified.

The aluminum conductor (Fig. 2) used on 227 miles is a standard product of the Aluminum Company of America.

It consists of 26 strands of aluminum with a total cross-sectional area of 795,000 circ.-mil, surrounding a core of seven galvanized steel strands, each 0.136 in. in diameter. Outside diameter of the cable is 1.108 in. and its weight is 1.093 lb. per foot. Breaking strength of the conductor is approximately 31,000 lb. In stringing, the aluminum was prestretched to 12,000 lb. for five minutes, then slacked to normal tension, about 7,500 lb. at ordinary temperature. Maximum design tension in the heavy loading section miles 36-2 to 41-1 was 12,000 lb. under 0 deg., ½ in. of ice and 6-lb. per sq.in. wind. Maximum in the balance of the line is 9,360 lb. under 25 deg. F. and 8-lb. wind without ice. Should heavy loading conditions be placed on the light loading section, a maximum tension of approximately 14,600 lb. would result, less than 50 per cent of the ultimate strength. The possibility of ice loading in this section is very remote (no case on record), since conditions in the interior desert regions are much less severe than along the Pacific Coast.

Aluminum conductor was shipped on reels containing approximately 3,960 ft. These were "spotted" by the contractor along the right-of-way directly from the railhead in most cases. Prior to "paying out" cable, the reels were placed in "dollies" and correctly spotted, then the three conductors were pulled out at one time by means of short lead lines from the ends of the conductor to a running board attached to the winch line of a 60-hp. caterpillar tractor. As each tower was reached the lead lines were passed over the sag blocks by means of lines left therein when sag blocks were hung, and the cable was pulled through the tower. This method kept a large portion of the cable off the ground, but much lagging was required in the central portions of the spans, especially where the ground was rocky.

The copper conductor used on 10 miles of the line was furnished by

[*Continued on page 107*]

Cathode Ray Movie a Tool for Circuit Load Study

By S. H. POLLOCK and D. D. CLARKE
Kansas City Power & Light Company, Kansas City, Mo.

ENGINEERS of the Kansas City Power & Light Company wished to analyze the rapidly fluctuating load of an 1,100-hp. synchronous motor operating a coal mine shovel supplied by a 33-kv. delta line. The load and field control both varied, giving power factors from 70 deg. lead to 165 deg. lag and loads from 2,250 kw. at unity power factor to 600 kva. regenerative. The complete cycle covers about one minute, which was too long a time to be recorded on the available galvanometer oscilloscope at the speed which would also show power factor relationships. It was suggested that the study be made with a cathode-ray oscillograph.

Its instantaneous response to changes of current and voltage can be combined to make any repeating function stand still on a fluorescent screen for inspection. This makes it an ideal tool for the power engineer to use in analyzing many loads. For rapidly varying loads it is possible to take motion pictures of the oscillograph target. By combining the oscillograph with a motion picture camera graphical records can be obtained for engineering analysis.

With the oscillograph connected in the circuit for study of the load on the shovel motor the pattern on the target changed too swiftly to be followed visually. Accordingly it was decided to make a motion picture record. This offered several advantages, the main one being that the film can be projected and the record studied unhurriedly by slowing down the projection time or taking the frames one by one.

The accompanying sketch shows the setup of camera and oscillograph. The target on the oscillograph is 3 in. in diameter. To focus this target on the film a pocket magnifying lens with a focal length of 5 in. was placed in front of the camera lens and 5 in. from the target. The lenses must be carefully adjusted to get the focus correct and a jig built to hold camera, lens and oscillograph in alignment while taking the pictures.

As this was our first attempt at photographing the target, the oscillograph was set at a high brilliancy, which gave a wide line. The film was developed as a negative and came out slightly overexposed. It would be possible to obtain the pictures at a lower brilliancy setting of the oscillograph, which will give a narrower and better defined line. If about 3 ft.-candles is allowed to fall on the face of the target the graduations on the celluloid scale will show up much clearer and make for easier calibration, providing that glare is avoided. A 16-mm. camera was used with an f2 lens and supersensitive Panchromatic film to record the fluorescent image on the oscillograph target. Exposures were made at the rate of sixteen per second. Alcohol was used to remove the gray dye on the back of the films after fixing.

The first record made was of current in one leg of the circuit. Putting the current on the vertical plates of the oscillograph and using the sweep circuit gave a sine wave that shifted back and forth, indicating changes in power factor, but there was no reference line to determine what the power factor was for any particular time. This sine wave was unsatisfactory for the analysis.

To facilitate analysis, the oscillograph figure was changed to a voltage-

[*Continued on page 113*]

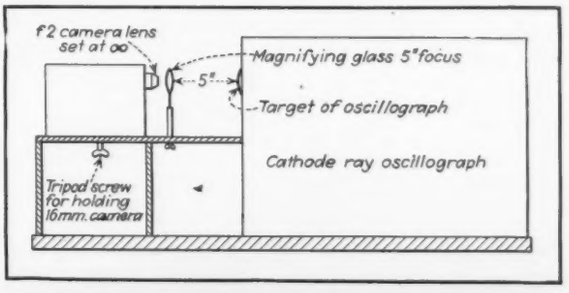


Fig. 1—Oscillograph and camera assembly

The oscillograph has two sets of deflecting plates, one for horizontal and one for vertical motion. Self-contained gain amplifiers give full scale deflection for voltages of 0.2 to 700 volts. To measure current a shunt is put in the current transformer circuit and the voltage drop across the shunt used to actuate the oscillograph. The two circuits for horizontal and vertical deflection are not electrically isolated so that care must be used to prevent a short circuit; *i. e.*, an isolating transformer should be used in the potential circuit.

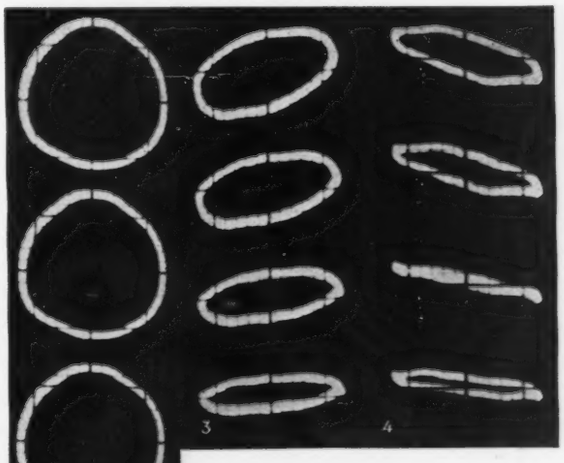


Fig. 2—Voltage and current in quadrature

Sequence is downward. Vertical sweep proportional to current and horizontal to voltage. Area of loop indicates power. Hexagon shape indicates presence of fifth harmonic.

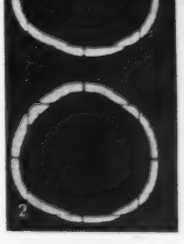


Fig. 3—Leading power factor

Sequence is downward. Loop reduces in area as power factor decreases. Inclination to right shows leading power factor. Presence of third and fifth harmonics is indicated by shape of loop as if it were the combination of a four and a six sided figure.

Fig. 4—Power reversal

Sequence is downward. Inclination of loop to the left indicates lagging power factor reducing rapidly as power input to motor drops. Loop collapses and reopens as motor stops taking energy and begins to return stored energy to the circuit.

Cleaning Chimney Gases by Dry Type Separators

By A. G. CHRISTIE
Professor of Mechanical Engineering, Johns Hopkins University, Baltimore, Md.

REMOVAL of solids from chimney gases is a live subject at the present time. No small factor in making it a matter of active effort and discussion is the definite trend toward load-center stations with their logical location in or near the more densely populated areas.

A brief discussion of the several diversified systems devised for cleaning flue and other industrial gases is presented here in so far as they appear applicable to power plant adaptation. No attempt is made to include all systems, nor is the omission of any particular system to be interpreted as a reflection upon the efficacy or value of that system. Rather have the methods been chosen to illustrate certain general principles and the means for their application. Before proceeding to discuss apparatus details it will be well, however, to set down the basic physical problem which is involved.

Nature of solids in flue gases

The solids that occur in flue gases may be classified in different ways. One system classifies as *cinders* those large particles of unconsumed fuel or coke that may be carried out of the chimney. *Dusts* are generally considered as particles varying from 1 to 150 microns in size (1 micron = 1/1,000 millimeter = 1/25,400 in.). The finer dusts have little tendency to settle in gases in motion. *Cloud* particles are those from 0.1 to 1 micron in size. *Smoke* is composed of fine carbon particles resulting from the incomplete combustion of fuels, and are generally less than 0.1 micron in size. There is no sharp line of demarcation between these various classes and they naturally blend into one another.

The smaller the solid particle suspended in the flue gases the more difficult is the separation of these particles with most commercial systems. Certain of these separation methods are more applicable to the removal of one class of solids than to another. These differences will be noted in the discussion of the various commercial types.

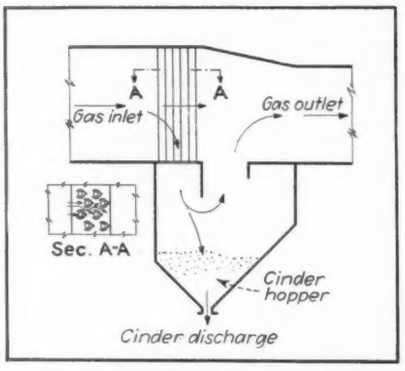


Fig. 1—Green's "Dustrap" has horizontal entrainment system

American Blower Corporation

Fig. 2—Alternating truncated cones and cylinders with cyclone constitute Sirocco dust extraction system

All present systems can be separated into either of two classifications, dry or wet systems. In the dry systems the solid particles are separated from the gases and are removed in the dry state. The disposal of this fine, dry dusty material often presents a difficult problem. In some cases the dry material, after it has been recovered, is wetted in order to convey it to a given location and to cause it to consolidate.

In the wet systems the solid particles are wetted and washed out with the effluent. The oxides of sulphur are absorbed to a varying extent by the wash water. The resultant effluent usually discharged into the circulating water may be neutralized by the natural alkalinity of this water, though in some locations it must be neutralized by lime before allowing it to flow away.

Little data are available in regard to cost and efficiency of the several systems. The statements in the following paragraphs are relative only and are based upon information furnished to the author by responsible parties who have had experience with the several systems. It must be kept in mind that plant arrangement and local conditions influence costs and also the comparative efficiency of the various systems. Unfortunately, there is no generally recognized standard of dust measurement in this country, though the need of such a standard is widely recognized. Until such a standard is established, differences of opinion will arise regarding the interpretation of data on dust quantities.

Dry systems for cleaning gases may be divided into three classes—entrainment, centrifugal and electrostatic. Centrifugal methods include fan separation and various forms of cyclones.

Green's "Dustrap" is a horizontal entrainment system. The larger solid particles, suspended in the gases, are carried forward (Fig. 1) in straight lines in a horizontal direction, and cannot change direction suddenly, due to their momentum. They are projected into the entrainment channels placed in the gas path and then carried into a cinder hopper below the channels. These channels are arranged in groups which may be alternately shut off and rapped to cause adhering dust to drop into the hopper. A screw conveyor removes the dust from the hopper. This and similar systems entrain the coarser dust particles and cinders and hence are particularly applicable to stoker-fired plants. Soot, fine ash particles and smoke may pass out with the gases. The pressure drop is not large. The efficiency based upon total solid contents of the gas is reported as moderate. The first cost should not be high, though space requirements are large.

Centrifugal devices

Among centrifugal devices are certain modified forms of fans such as the Sturtevant "Cindervane." These have blades so modified that the larger solid particles are thrown out by centrifugal force and guided into a chamber in the housing which delivers the particles into a settling chamber. These are applicable to stoker-fired plants as they cannot separate out the very fine dust particles.

In another system the gas is delivered tangentially into a volute casing at fan entrance. This casing is provided with a series of backward sloping vanes into the fan inlet and the gas must suddenly reverse itself in order to enter the fan. The dust particles are retained in the outer rim of the volute. These particles are then drawn off from the curved outer casing into a cyclone separator and removed. The gas drawn off with the dust particles returns from the cyclone to the fan inlet. No information is available at the moment upon the effectiveness or cost of this system.

Many centrifugal separators of the cyclone type have been developed through which all the gases are passed. In the Sirocco system (Fig. 2) a series of alternating truncated cones and cylinders is arranged beneath the cyclone proper, which the gases enter tangentially. The dust passes to an outlet at the bottom, while the clean gases leave by a central opening in the top of the cyclone. Separation is dependent upon centrifugal action resulting from the vortex formed by the leaving gases in the center of the whole elongated chamber. The greater weight of the dust particles forces them outward against the periphery by centrifugal force. Separating effect increases with decreased radius and increased entrance velocity. The long spiral dust path increases the separation of the finer particles. In order to keep velocities high, these separators are often furnished in multiple and are cut in and out of service in proportion to the total gas flow. This type of plant increases the draft losses and requires additional auxiliary power. Its efficiency is low at light loads on an individual cyclone, but increases with output. High efficiencies are claimed on the newer types. The Sirocco dust extraction plant may be placed on the suction side of the induced-draft fan. The wear on fan parts is thereby lessened. Another type of multi-cyclone has an inlet damper under automatic control which adjusts the inlet for varying gas flows to maintain the necessary velocity for effective separation in the cyclone.

Another centrifugal system (the Van Tongeren from Holland) has recently been installed in several American plants. The flue gases (Fig. 3) are directed tangentially into the volute of the main cyclone in which the double-eddy current, which is set up wherever a stream of gas flows along a curved path, is utilized to carry the dust particles to the periphery of the volute casing. The clean gas escapes to the chimney in the middle section of this primary cyclone through adjustable vanes which are inclined in the opposite direction to gas flow in the volute so that the gas makes a sharp change in direction of almost 180 deg. when entering the central portion of the cyclone. The dust particles, due to their momentum, continue in the volute.

A particular claim for this system is that dust separation at top and bottom of the volute would not be good, due to these eddies. Hence, no entrance to the chimney is provided at the top and bottom, but only in the central portion of the volute. The dust particles, together with 10 to 15 per cent of the total gases, are drawn from the outer periphery of the volute into a second cyclone collector, where separation of the solids is effected. The clean gas from this second cyclone passes direct to the chimney.

Like all cyclones, the best performance is secured at full capacity. However, the deflecting vanes in the first cyclone can be adjusted by hand, or automatically, at partial loads so as to maintain high efficiency of dust separation even at partial loads.

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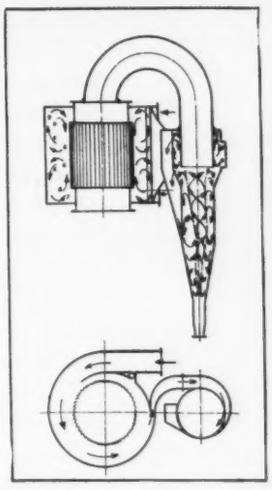
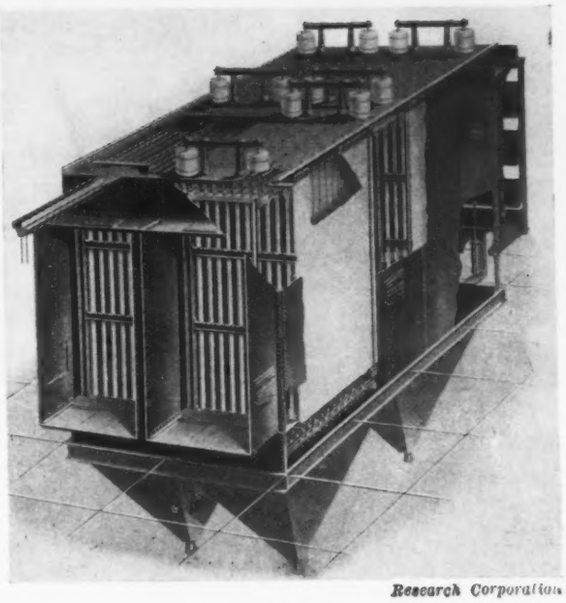


Fig. 3—Van Tongeren system has flue gases directed tangentially into volute



Research Corporation

Fig. 4—Cottrell plate precipitator passes gases between charged surfaces

Editorials

S. B. WILLIAMS, Editor

Texas Pays High Price to Learn About Flood Control

THIS WEEK the State of Texas opens at its state Capitol an investigation of a flood which swept down the lower Colorado, leaving losses of approximately eight to twelve million dollars in its wake—a flood which farmers of the inundated valley describe as "man-made."

The investigation will be centered on Buchanan Dam, located on the river some 90 miles above Austin and constructed ostensibly for flood prevention and flood control. However, in violation of the rudimentary principle that flood control dams must be kept nearly empty, the dam was kept nearly full of water. As a result, when the rains came, impounded water flooded wide areas back of the dam, and then when the gates were opened to halt that damage the resulting flood took homes, bridges, railroad tracks and livestock on its swirling rush down-river to the Gulf of Mexico.

Investigations are probably necessary to establish facts for the record, but the flood and the investigation can be of vast worth if only they are used to prove once more to a few people in Washington that flood control and power generation are incompatible for any dam. They always have been, as engineers have so often stated, and until certain natural laws are changed they always will be.

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First Half Year of Adequate Wiring Program

SIX MONTHS ago the National Adequate Wiring program was launched. That is not a long time for a co-operative promotion activity to get under way and for that reason the results that are being chalked up are all the more remarkable.

In approximately one hundred cities, with a combined population of close to twenty-seven millions, adequate wiring activities are now under way. Of these, some fifteen cities with more than thirteen millions of people have taken out licenses for wiring certification. The first certifications of completed jobs have been made within the last few weeks and a large number are being installed. More people are hearing about adequate wiring today than ever before and the activity has only just begun.

Although much has been accomplished, this first half-year and several months in the future should be considered more as the industry training period. It has been necessary to organize locally, to understand what constitutes adequate wiring and to get the local people well acquainted with the program.

That this training period is producing results in terms of jobs wired is fine, but the real volume will come in the next period, when a practical sales approach has been worked out. One of the principal reasons why public acceptance of adequate wiring has been so slow has been the lack of a proper sales approach. A practical sales manual, based not on generalities but upon specific customer benefits, is needed. Local sales instruction based upon such a manual should step up the volume of adequate wiring manyfold.

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A Thousand Billion Kilowatt-Hours?

ENVISIONING a tenfold increase in the country's output during the next seventeen years and the development of electron tubes for conversion from a.c. to d.c. and back again at half a million volts, or higher, J. D. Ross, Bonneville administrator, has outlined a scheme for connecting the great load centers of the country with power plants distant by the breadth of the continent. The purpose is to show that present federal power developments, far from constituting excess capacity, will merely be units in a vastly greater scheme of nation-wide scope.

There can be no condemnation of dreams and visions. Without them progress would cease. But when a responsible engineer has visions it can do no harm to turn the light on them. Certainly the prospective use of d.c. transmission, made possible by development of tube rectifiers, is more than a mere fancy. But is a tenfold increase to 1,210,000,000,000 kw.-hr. probable, by 1955 or any other year not too remote?

The expected tenfold increase in seventeen years is based on the average growth from 1887 to 1929. During that period the output increased tenfold in about every sixteen years. It doubled every four years and eight months. In the 50 years from 1887 to 1937 it doubled in every five and a quarter years. Mr. Ross assumes that another tenfold increase is due in the next seventeen years. Is it? If a boy's weight increased tenfold during his first fifteen years, does it follow that he will weight half a ton at 30, and five tons at 45?

To begin with, the energy produced in 1887 is a very doubtful quantity. The first census of the industry was not taken until fifteen years later. Obviously any error in the estimate for that year will greatly affect the apparent rate of multiplication. But let that pass.

Comparison of the census statistics at five-year intervals shows a continuously declining rate of growth. In the interval from 1902 to 1907 the growth was 2.34-fold. It never again matched that rate. In the 1927-1932 period it was only 1.07-fold, in the next one 1.45-fold. To eliminate the depression year, compare the ten year periods 1902-1912 and 1927-1937. The rate of growth in the former was 4.6 times, in the latter only 1.55 times. This would give a production of 183 billions in 1947, 292 billions in 1957. But that assumption ignores the slackening of the rate, and is, therefore, too liberal. Even at that it is less than a fourth of Mr. Ross' prediction.

Data on horsepower used in manufacturing covering the period from 1869 to 1929 show a similar trend, though the change is less marked. Population growth, long ranging around 1.35-fold per decade, was only 1.15-fold from 1910 to 1920 and about the same in the next decade. Students of the subject foresee a static condition about 1970 or 1980.

The United States is growing up. Forecast must take this fact into account. Growth will continue, but at a slackening rate. Exaggerated predictions serve no useful purpose.

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When Will Courts Review the Holding Company Act

THE recent request of SEC Chairman Douglas that sixty-six holding companies prepare and submit plans before the year end looking to simplification and integration of utility systems suggests a question that seems on the surface to have been generally disregarded, if not overlooked.

The question comes from that forgotten man—the U. S. citizen who managed to save a few dollars and with them bought a stake in the public utility business, who asks upon what grounds has Section 11b—the death sentence—been found to be constitutional.

As a matter of fact, the only question with respect to the entire Holding Company Act of 1935 so far adjudicated has been that raised in the hand-picked case on Section 5 of the act, in which it was held that the provisions of the act were separable and that the companies must register. Finally, the courts pointed the way for companies to seek further remedies if after registration they saw their constitutional rights jeopardized.

Perhaps the commission recognizes that this hurdle is still to be jumped in suggesting that the companies take the initiative, that they originate and present plans to reshuffle the utilities into a more pleasing arrangement of locale and voting power.

Regardless of the various approaches and their expediency, sooner or later our forgotten man's question as to the constitutionality of the act, especially Section 11b, will have to be answered.

Oil Research Needed

MUCH of the oil-filled and oil-cooled electrical equipment that was placed in service in the 1920-1930 decade is now approaching the stage of its functional life at which, quite naturally, the matter of maintenance of the oil is becoming increasingly important.

Millions of gallons of oil are involved. Some of this oil will be found so badly deteriorated by sludging and acidulation as to warrant its discard in favor of fresh oil, either new or reclaimed. But it is unlikely that such replacement with new oil can function for all the remaining decade or more of useful life of the equipment, especially if difficulty is experienced in flushing out the sludge accumulations in the cooling ducts. Coupling this source of local heating with the tendency toward loadings nearer to ultimate rating, there is more predisposition toward deterioration of the oil than when the original oil was placed in the new equipment. Inhibitors in present oils are designed to afford resistance to oxidation and sludging.

If reconditioning and reclaiming of the used oil proves to be the practical procedure in most cases, that procedure warrants active study at the present time. Whatever chemical processing is used should be not too elaborate and intricate and the equipment for it should combine simplicity with mobility or even portability. The utilities could well pool their ideas and their studies.

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Modern Kitchen Bureaus Cash In on Promotion

THE Modern Kitchen Bureau program has been a highly effective means of focusing the efforts of all parts of the electrical industry upon the utility's primary goal of building compensatory load through the promotion and sale of major appliances. There are very few, if any, national programs available to the companies today which have better resolved the differences of opinion between the four elements of the business and the differences between the utilities themselves. A modern, 1938 model selling program has been sold to the industry and the industry has sold it to the public.

Results, however are of paramount importance. It is, therefore, a highly significant story which a group of selected utilities present in this issue outlining the basic operations which they have followed in building load through the Modern Kitchen Bureau plan and presenting the actual results they have been able to achieve. Representing utility selling at its best, properly co-ordinated with the balance of the industry, these results should provide great encouragement to the sales forces of participating utilities and encourage other utilities to investigate the profit possibilities to themselves and to their customers of the electrical industry's own Modern Kitchen Bureau.

Lots of Talk, but Where Are the Facts

By CARTER FIELD

The background to Washington news being always much more exciting and frequently more informative than the news itself, Mr. Field's long journalistic experience makes his personal interpretations not only interesting but authoritative.

THERE have been lots of flabbergasting investigations by Congressional committees. Absurdities have revealed truth. Nonsensical happenings have thwarted high purposes. There is the case where a circus midget sat in J. P. Morgan's lap, and, for some reason no one can intelligently explain, this made Morgan "human" and virtually turned the political attack on him to a dud. There was the silly "black satchel" episode which turned Teapot Dome from a flat failure to a devastating scandal.

But never has there been anything quite like the investigation of the Tennessee Valley Authority, now under way at Knoxville by a joint Congressional committee. Something may turn up, and this writer is enough of a Micawber to hope so. But let's look at the picture.

What does the ordinary patriotic citizen hope the investigation to reveal? Presumably, among other things, whether the whole project is worth the more than $500,000,000 it will cost the U. S. Treasury. Whether its worth is sufficiently greater than that to compensate for the destruction of values so inevitably connected with it (private investments in utilities, flood of the most fertile bottom lands in the river valleys, resulting loss of local, state and federal taxes, etc.); whether the much-talked about "yardstick" will function in fixing equitable electric rates all over the country; whether there has been any scandalous dishonesty; whether the flood control system is adequate, yet commensurate in cost with the average flood damage, and capable of being utilized at a reasonable cost on other rivers; whether navigation of the Tennessee river, as carried out under TVA, is economically sound, and whether the net result of the whole project is to lift out of their present state a huge population which has been repeatedly declared to be, say, below the national level.

The committee began its hearings in Washington, recessed, took a five-day inspection trip over the project, and has been busy taking testimony since July 15. There has not been one ray of light on whether the entire project is worth what it cost. Not a single computation. Nothing but oratorical generalities by Lilienthal and H. A. Morgan. There has been no estimate made of the amount of lost federal, state and local taxes which should be added to the annual carrying charges of the project.

Yardstick detonated

Lilienthal himself detonated the yardstick idea, to the great astonishment of Administration Senator Schwartz, who asked the question. It has nothing to do, he made clear, with what the privately owned utilities should charge their customers. A biased version of his answers on this would read: People have a right to pay high taxes and then get electricity cheaper than a private company could sell it.

There has been not even a charge heard by the committee of actual dishonesty on the part of any one inside the TVA. The nearest approaches to it are the Berry marble case, where A. E. Morgan attacks Lilienthal for not slapping Senator Berry down promptly, and the phosphate land purchase, where Morgan only charges stupidity.

No witness has attempted to prove to the committee, even by oratory, much less by figures, that the flood control established is worth any definite figure. Certainly no attempt has been made to allocate the flood control *benefits* to the flood control *allocations*, as already made and to be made.

As to whether the submerged—economically—population has been benefited, the committee is no better informed than when it left Washington. It knew then that the government had bought farms from a lot of the inhabitants and put thousands of persons on the payroll. As to what happened to the folks who sold their farms, A. E. Morgan testified the resettlement job was "nothing to be proud of." He also testified there had been a tendency to gyp those who did not know how to protect themselves, and to pay too much to those who did.

But when it comes to the personalities, to what Senator Frazier impatiently calls the "charges and counter-charges," there has been evidence piled on evidence, documentary proof piled on scolding memoranda, straining at gnats and swallowing camels.

The committee has been thoroughly convinced that Lilienthal and H. A. Morgan thoroughly dislike A. E. Morgan, and that the feeling is reciprocated.

Were it not for one factor, however, the committee members would be inclined to laugh at all of the charges and counter charges. They are inclined to accept, for instance, the explanation of why TVA counsel J. L. Fly wanted two sets of estimates for dams, one for flood control, one for navigation; why he wanted the engineers to add these two together and then subtract the total from the total estimated cost of the dams, thus using an absurd premise to prove that the cost of power was actually trivial (especially absurd in that the cost of the land bought for the reservoirs was thus counted twice).

But in taking John Lord O'Brian's word for it that this was a proper preparation for some queer legal attack which the power companies *might* have made in their case, the committee members could not accept the Lilienthal interpretation—that when A. E. Morgan was alarmed about the integrity of his engineers when he heard about this curious set of estimates, and talked excitedly to his engineers about it, he was "sabo-

[*Continued on page 104*]

News OF THE WEEK

Power Phase of Buchanan Project Attacked by Farmers at Meeting

Investigation of the causes of the flood along the Colorado river in Texas fails to appease sufferers from recent disaster — Dallas News says project is masking — Fails to provide flood control

Vitriolic denunciations of the federal power program in making power production primary in flood control projects continue at white heat in Texas following the disastrous flood in the Buchanan Dam area along the Colorado river.

Although Secretary Ickes has dispatched a PWA engineer "to investigate charges that waters released from Lake Buchanan caused the flood on the Colorado in Fayette County" and the state has taken up a separate inquiry, the stream of protests against the flood-power project continues unabated.

Charge of negligence

Damage to crops and property is estimated at between $8,000,000 and $12,000,000 caused by the flood. At protest meetings farmers charged negligence in the operation of the floodgates of the dam. Demands were made that the dam be limited to flood control and an end put to power generation.

The Lower Colorado River Authority asserted that flood control cannot be accomplished until the completion of the huge Marshall Ford Dam. Congressional members from Texas explained at a meeting, which brought about a state inquiry, how funds were obtained for the flood control and power project. Representative Mansfield said that the floodwaters will never be controlled.

Attacks power phase

Sharp issue was taken by the Dallas *Morning News* in a scorching editorial. The editorial stated that the "Colorado Authority has provided a power project and not flood control" and that it is "masking as a dual one without making adequate provision to carry out the pledge of flood control made to the trusting and anxious residents of the valley."

The Dallas *News* further commented that "the whole trouble in the matter of the Colorado dams, as with the TVA system and many other similar projects, is that they are sham dams. They pretend to be one thing when they are another."

The Smithville *Times* of August 4 in a full page pictures the "Mighty Buchanan" and asks "What is your mission—flood control and prosperity or power duplication and disaster?"

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Senator Davis Makes Outside TVA Inquiry

A searching investigation into the books, costs, allocations and expenditures of TVA is now under way by special accountants, headed by M. C. Conick of Pittsburgh, Senator James J. Davis of Pennsylvania revealed this week. This private inquiry has been necessary, it was explained, because the special Congressional committee has been unable to obtain any information of the workings of the government's experimental power project except through witnesses on the TVA payroll.

The right to examine all TVA records, books and files has been approved by Chairman Vic Donahey. Expenses of the examination are being met by two friends of Senator Davis who are not connected with any private power company or any other interests affected by the TVA controversy. Mr. Davis said that he might name the two friends later.

Because of lack of funds the committee has been forced to limit its inquiry and to seek outside aid in order to carry on its work of finding out "behind the scene" actions of the TVA and how it developed the "yardstick," which now has been admitted to be not a true measure of private electric rates.

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Ross Sees Power Net Linking All Plants

Intertying the giant federal power plants by means of transmission lines up to 3,000 miles in length, from ocean to ocean, with cross ties from Canada to Mexico and the Gulf of Mexico, was advocated by J. D. Ross, Bonneville Administrator, at a recent meeting of the Engineers' Club of Seattle.

Mr. Ross declared that direct-current transmission would be used instead of the system of alternating lines in use today. It was pointed out that the present alternating-current system would not be disturbed and that the direct-current lines would act as links between all the large plants.

It was the opinion of Mr. Ross that the creation of a nation-wide power pool would eliminate possible shortages of power in sections as the supply could be shifted with the load as the sun moves west. A nation-wide power shortage was evisioned should consumption increase in the next few years as it has in the past. Mr. Ross said that output in the past 50 years doubled every five years and three months. This is a tenfold increase in less than eighteen years. On this basis output in the next period will increase ten times, or to 1,210,500,000,000 kw.-hr.

Mr. Ross said that 1,000,000-kw. loads can be expected in place of the present 100,000 kw. "We can expect a line carrying 100,000 kw. today to be replaced by one carrying 1,000,000 kw.," he said. It was found that the total available water power, developed and undeveloped, of 63,000,000 kw. is insufficient to meet power demands and that steam plants must be built. Mr.

Ross saw the need of 222,000,000 kw. of additional steam plants.

Mr. Ross revealed plans for immediate construction of lines interlocking Bonneville with Grand Coulee and Seattle's municipal hydro projects

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Propose 1,090 Miles of New Rural Lines

Fifteen Pennsylvania electric companies filed applications from January 1 to August 1 with the Public Utility Commission for permission to construct extensions to their rural electric lines, having a total length of 1,090 miles, to serve 4,474 customers in 45 of the 67 counties in the state.

The companies, with the planned mileage of construction and the number of customers to be served by the proposed extensions follow:

West Penn Power, 445 miles, 2,235 customers; Pennsylvania Power & Light, 347 miles, 1,025 customers; Metropolitan Edison, 187 miles, 752 customers; Pennsylvania Electric, 9 miles, 49 customers; Northern Pennsylvania Power, 8 miles, 34 customers; South Penn Power, 20 miles, 60 customers; Southern Pennsylvania Power, 36 miles, 138 customers; Keystone Public Service, 9 miles, 62 customers; Edison Light & Power, 9 miles, 35 customers; Glen Rock Light, Heat & Power, 8 miles, 39 customers; Erie Lighting, 1 mile, 11 customers; Bradford Electric, 4 miles, 11 customers; Harvey's Lake Light, 1 mile, 12 customers; Abington Electric, Clarks Summit, 1 mile, 4 customers, and Solar Electric, 1 mile, 7 customers.

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Florida Power & Light Plans to Fight Rate Cut

Florida Power & Light Company plans to carry the fight against a Miami city ordinance lowering power rates to the United States Supreme Court, according to Bryan C. Hanks, president.

Last week the federal Court of Appeals allowed the utility sufficient time to seek a review in the Supreme Court. John P. Stokes obtained from the Appellate Court an order withholding the rate case mandate for 60 days after August 5. The lower court had upheld the rate ordinance.

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Georgia Power Dealer Sales

Dealer sales of major appliances during the first four months and estimated annual revenue as reported by the Georgia Power Company were: 386 ranges, $11,580; 125 water heaters, $3,000; 2,661 refrigerators, $39,915.

In ELECTRICAL WORLD for July 9, 1938, the E.A.R. figures were incorrectly given; the above revisions are by the Georgia Power Company.

Alabama Rural Plan ExtendedDuring1938

Alabama's rapidly expanding rural electrification program was the object of praise by Gov. Bibb Graves in an address recently made at the annual Farm and Home week at the Alabama Polytechnic Institute at Auburn. Governor Graves said 3,550 miles of rural lines would be built this year by the Alabama Power Company, TVA and by rural cooperatives, and that lines built since 1935 would total 8,481 miles.

"Rural electrification serves an average of four customers a mile," he stated, "and that means power will be going to 33,294 families by the end of 1938 who did not have access to electricity in 1934. And we are going to continue the work."

The Governor brought with him a set of figures prepared by Gordon Persons, state rural electrification director, which showed that nine rural electrification co-operatives formed under the state authority had built and put in operation 2,457 miles of line, costing $2,160,400 and serving 10,043 customers.

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Utility Buys City Plant

The town of Virgilina, Va., near the North Carolina border, has sold its municipal electric plant to the Virginia Public Service Company, which will operate there under a 30-year franchise, M. J. O'Connell, president of the company, has announced. Sale of the plant, which has been in operation fifteen years, was approved by Virgilina Councilmen with only one dissenting vote. The Halifax County town has a population of about 400.

Mr. O'Connell said that, as soon as all negotiations are completed, Virginia Public Service will begin construction of a 10-mile line from Buffalo Springs. Electric service also will be provided to areas along the line.

•

Adequate Wiring Progress Reported by National Bureau

To take care of requests for presentation of the Adequate Wiring Program in those centers where it is not convenient to send a field representative, the executive committee of the National Adequate Wiring Bureau has organized a speaker's bureau, which has received acceptances from more than forty men to take care of assignments in their respective territories.

Approximately 140 homes in the territory of the Omaha Electrical League are ready to be certified as being adequately wired, according to E. S. Northrup, wiring advisor of the Nebraska Power Company. The Charlotte, N. C., adequate wiring bureau recently certified the first home in its territory and reports a second home ready for certification.

FIRST WIRING CERTIFICATE—T. V. Gargan, chairman Adequate Wiring Bureau of the Electrical Association of Philadelphia, presents first certificate for adequate wiring in this territory to B. Franklin Theobald, builder of new home at Township Line and Farwood Park. S. B. Taylor, Jr., Philadelphia Electric Company, is between them; Sheridan Taylor, Electrical Association of Philadelphia, at right

Utilities Asked to Submit Plans for Integration of Properties

Chairman Douglas in letter to 66 holding companies sets December 1 deadline — Proposals to conform to utility act must co-ordinate changes necessary in other systems involving disposition of assets

Executives of utilities in all sections of the country prepared this week to speed studies looking toward simplification of corporate structures and integration of properties to meet provisions of the utility act.

Last week William O. Douglas, chairman of the Securities and Exchange Commission, sent letters to 66 public utility holding companies advising them to submit plans for integration of properties not later than December 1, in order to comply with the "death sentence" of the act. A letter was also sent to the utilities committee organized last May and headed by James F. Fogarty, president of North American, and C. E. Groesbeck, chairman of Electric Bond & Share.

Letter a surprise

While the companies have been considering the integration provision since the act was passed in 1935, the Douglas letter came as a surprise. Mr. Douglas stated that "during recent months representatives of a number of public utility holding company systems have been discussing with us informally their plans for compliance with sections relating to integration of properties and simplification of corporate structures.

It was pointed out by Mr. Douglas that any proposed plan of any one system dealing with acquisition or disposition of assets or of securities usually involves the plans of one or more systems. For this reason, Mr. Douglas said, the SEC was requesting that plans, even though tentative, should be submitted so that the commission could view the developments of one system in the light of the requirements of the various systems which may be directly or indirectly involved.

Seeks co-operation

Before the annual meeting of the American Bar Association at Cleveland, July 26, Mr. Douglas expressed the hope that, "before the year is out, we will obtain from the various parts of the industry their plans and programs, so we can chart our course accordingly." Last week Mr. Douglas stated that he wished to emphasize that the SEC is not departing from its program for co-operative endeavor, but is seeking rather to implement the round-table technique with a concrete proposal to those who want to get on with the job of simplification and integration.

Mr. Douglas did not press the utilities to present a complete plan, but at least one which was sufficient in scope to encourage discussions leading to the solution of the problems resulting from the act. It was felt that tentative plans would involve disposition of properties and for this reason other systems would be involved in sales or purchases of properties. In order to adjust the utility map of the country to conform to the pattern of the act revamping of one or more systems must be done in co-ordination with other systems directly or indirectly affected.

While the utilities are endeavoring to work out reorganization plans and co-operate with the SEC, the general feeling is that the SEC-Electric Bond & Share case failed to present a guide and a test of the constitutionality of the act as the government had promised. Many believe Section 11 is unconstitutional and that the initiative for a test must originate from the SEC. This test will probably come when the SEC "cracks down" to force disposition or acquisition of properties.

Utility officials declare they will continue to co-operate with the SEC.

•

Government Appeals Claytor Dam Case

The United States has appealed from the decision of Judge John Paul, given in United States District Court at Roanoke, Va., last April, denying the petition of the government for an injunction to restrain the Appalachian Electric Power Company from proceeding with the construction of Claytor Dam, several miles above Radford, on New River, without a license from the Federal Power Commission, it was announced last week by Joseph H. Chitwood, United States District Attorney.

In orders signed by Judge Paul and filed in the clerk's office at Roanoke, the appellant was granted until November 10 to file a certified copy of the record on appeal with the Circuit Court of Appeals of the fourth circuit and the defendant was directed to appear before the court in Richmond within 40 days from the date of the taking of the appeal.

The petition for the appeal was signed by Joseph H. Chitwood, United States District Attorney of the western district of Virginia; John W. Aiken, special assistant to the Attorney-General, and Willard W. Gatchell, attorney for the Federal Power Commission, as solicitors for the appellant. The petition assigned 83 alleged errors as grounds for an appeal.

•

Extends Idaho REA Project to Serve Canadian Border

The service of a Boundary County, Idaho, REA-financed rural electrification project was extended recently to a customs office and to the homes of five customs officials on the Canadian side. Four of the customers over the line are at Eastport and two are at Forthill. The Northern Idaho Rural Electric Rehabilitation Association extends for some 159 miles in Bonner and Boundary counties, serving about 500 customers.

The only expense to the co-operative in extending its service to the Canadian border was the purchase and installation of three master meters on as many poles on the United States side of the line. The service drops, poles and individual meters of the Canadians were installed at their own expense. The same transformers serve customers in the two counties.

•

EHFA Closes Contracts for Appliance Financing

Electric Home and Farm Authority has announced that contracts have been closed with the following private utility companies, co-operatives and municipalities:

Lamar Electric Membership Corporation, Barnesville, Ga.; Marion Rural Electric Co-operative, Inc., Marion, Ohio; Clark Electric Co-operative, Greenwood, Wis.; Municipal Electric Plant, Hutchinson, Minn.; Commonwealth Edison Company, Chicago; Puget Sound Power & Light Company, Seattle; and the Sumter Electric Membership Corporation, Sumter, Ga.

Contracts have also been signed with the following:

City Light & Power Works, Fort Wayne, Ind.; Indiana Service Corporation, Fort Wayne, Ind.; St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.; Pioneer Rural Electric Co-operative, Inc., Piqua, Ohio; Imperial Irrigation District, Imperial, Calif.; Tri-County Rural Electric Membership Co-operative, Inc., Mansfield, Pa.; Memphis Light and Water Division, Memphis, Tenn.; Hart County Electric Membership Corporation, Hartwell, Ga., and the Jefferson County Electric Membership Corporation, Louisville, Ga.

PWA Program Passes $1,000,000,000 Mark

Five power projects, of which four are non-competitive municipal power improvement projects in Iowa, Michigan, North Dakota and Oklahoma valued at a total of $373,940, and one competitive power project for an electric plant at Freeman, S. D., to be constructed at a cost of $106,000, were included in a list of 87 additional non-federal PWA projects announced last week by Secretary Ickes.

The Freeman project calls for construction of a Diesel-electric light and power plant and distribution system, including street lighting. It was announced that the franchise covering electric light and power service had expired, and the project as proposed provides facilities for similar service. An allotment of $49,700 is conditioned upon the town's making a bona fide effort to buy the existing competing utility, the Northwestern Public Service Company. The total cost of the five projects at completion is estimated at $15,604,146 and the PWA grants total $7,023,844.

This brings the total of approved non-federal projects to 3,318 with a total estimated construction cost of $905,336,856. In addition, there have been approved 953 federal projects with grants of $196,840,871. The total completed cost valuation of the new program to date is $1,102,177,727.

Another competitive municipal power project was included in the allotments announced by Administrator Ickes on July 30. Vandalia, Mo., got a grant of $77,535 to finance the cost of building a power plant and distribution system, estimated cost $172,300. The project includes a Diesel electric light and power plant and distribution system, including street lighting and necessary equipment. The franchise of the Missouri Power & Light Company expired in April, 1937.

•

SEC Fixes Joint Hearing on Utilities Power Plans

Edward C. Johnson, trial examiner in the Utilities Power & Light Corporation hearings before the SEC, has announced that public hearings on the "death sentence" and on the various plans of reorganization submitted by Atlas Corporation and Associated Investing Corporation will be postponed to August 29. The hearings were scheduled to get under way on August 8.

On August 29 the SEC will hold a consolidated hearing on these matters, Mr. Johnson said, as well as the plan filed by the trustees of Public Utilities Corporation and Webster Securities Corporation and on the Atlas plan filed last October.

•

Committee Reports Out N. Y. Power Plan

Sharply reversing itself, the committee on public utilities at the New York Constitutional Convention last week voted to report out without recommendation the Poletti water power proposal which it had previously twice voted to kill.

The proposal, which New York Supreme Court Justice Charles Poletti is sponsoring in behalf of the State Power Authority, would provide that the St. Lawrence and Niagara river water power and water power sites remain in the possession and control of the state, which is prohibited from leasing, licensing or otherwise transferring such power and power sites except to a public corporation or agency.

Thus any development of these sites by private individuals or corporations would be prevented. Previous to taking the vote on reporting out the proposal, an attempt to amend it to permit the Legislature to renew private power grants to the Niagara Falls Power Company for the next ten years failed by a vote of 9 to 3.

•

Ordered to File Hydro Cost

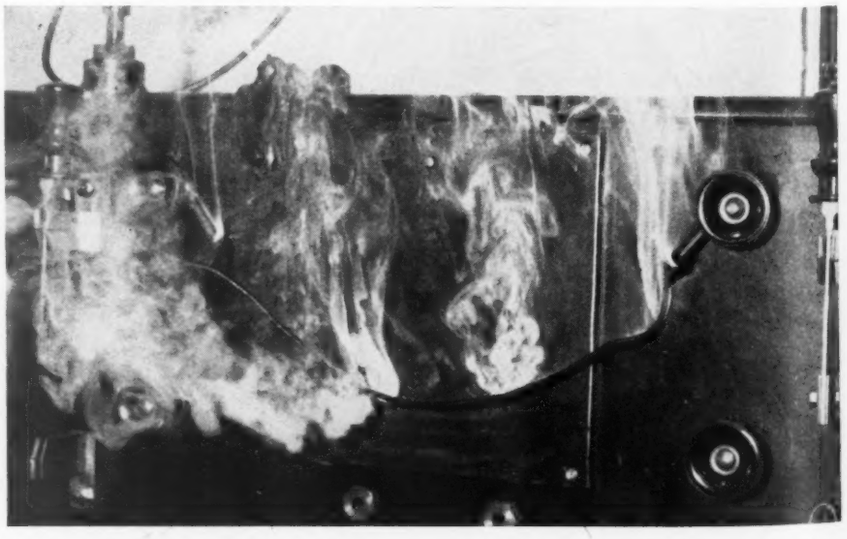
Federal Power Commission has ordered the city of Allegan, Mich., to file by October 14 a statement showing the actual legitimate original cost of construction of the city's Calkins Bridge hydro project on the Kalamazoo River, constructed under FPC license, and placed in operation in 1936.

Expose Fire Hazards of Meter "Jumping"

Few persons think of the danger to life and property connected with meter tampering, Harry E. Duren, president and manager of the Western Massachusetts Electric Company, Greenfield, said this week in discussing a recent conviction in an energy diversion case. To bring the risk home to the public and further to discourage amateur electrical tinkering with meter jumper schemes to save a few dollars a month the company recently made public a photograph of a jumper bursting into flames from overheating on a 110-volt circuit after a few seconds overload. The local press featured this, with an interview with Mr. Duren in which the subject of energy diversion was reviewed from the standpoint of safety and liability of detection. The chief of the local fire department also manifested interest in the prevention of this practice.

To a representative of ELECTRICAL WORLD Mr. Duren stated that while he was initially in doubt as to the wisdom of local publicity on energy diversion, he concluded that fear of putting meter jumping into the popular mind was totally unfounded.

Many favorable comments were received after the publicity given the matter, and the number of convictions obtained of late has brought home the point that the game is not worth the candle. In many places where jumpers are found the company requires that the customer's wiring be modernized, preferably with the installation of an outside socket-type meter. Where diversion occurs in multiple-family houses excellent co-operation is being received from many owners when the fire hazard is brought to their attention.



FIRED METER JUMPER—Overloaded meter jumper became red hot after a few seconds during test to demonstrate fire hazard in meter tampering

Output Continues to Gain

Production exceeds previous week's—Rises closer to 1937 —One region breaks through

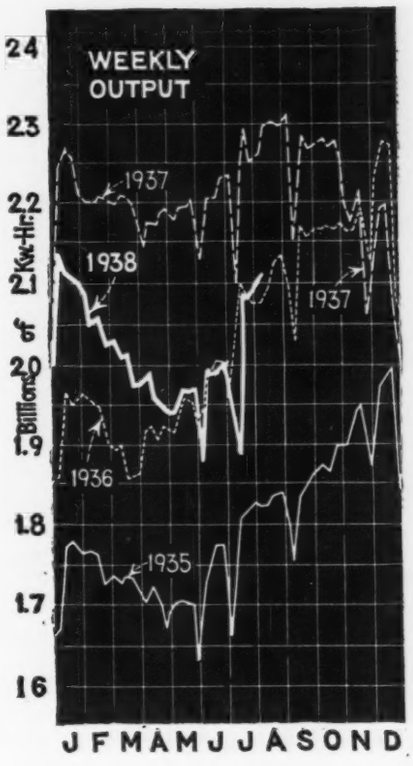
Accelerating the rise of recent weeks and continuing on the upward trend it has followed for nearly four months, the output of the electric light and power industry during the week ended August 6 rose 1 per cent over the preceding week to 2,115,847,000 kw.-hr., according to the Edison Electric Institute. This production figure is the higest since the week of January 15. It brings a further reduction in the gap compared with the corresponding period of the preceding year to 6.4 per cent, after ranging around 10 or 11 per cent from the middle of April to July.

Compared with 1936 the latest figure shows an increase of nearly 2 per cent. This also is a gain over the recent past, when output was closely matching that of two years ago.

For the second time in three weeks the Middle Atlantic region broke through last year's level. In the Central industrial area the disparity compared with 1937 was the smallest since February and in the Rocky Mountain states it was the smallest since March. In other regions no pronounced changes appear.

Weekly Output, Millions Kw.-Hr.

1938	1937	1936
Aug. 6.2,'16	Aug. 7..2,262	Aug. 1..2,079
July 30.2,094	July 31..2,256	July 25..2,088
July 23.2,085	July 24..2,259	July 18..2,100
July 16.2,084	July 17. ?,298	July 11..2,030
July 9.1,881	July 10..?,096	July 4..1,956
July 2.2,015	July 2..2,238	June 27..2,030



Per Cent Change from Previous Year

Region	Week Ending Aug. 6	July 30	July 23
New England	− 7.7	− 6.6	− 5.3
Middle Atlantic	+ 1.1	− 0.3*	+ 0.5
Central Industrial	−13.2	−13.5	−15.8
West Central	− 4.3	− 3.8	− 5.3
Southern States	− 6.7	− 4.5	− 4.7
Rocky Mountain	−14.4	−17.3	−19.3
Pacific	− 2.6	− 3.9	− 3.2
United States	− 6.4	− 7.2	− 7.7

* Revised

Electric Rate Reduction Announced in New Orleans

Electric rates for residential and other small lighting consumers in New Orleans will be reduced effective August 15 in accordance with an agreement reached between Mayor Robert S. Maestri and President A. B. Paterson of the New Orleans Public Service, Inc.

The reduction cuts the top figure of the rate structure from 6½ cents to 4½ cents for residential customers and from 6½ cents to 5½ cents for other small lighting users. The reduction, which averages about 15 per cent, will save New Orleans electric customers approximately $500,000 a year.

•

Louisiana Merger Approved

FPC has approved the proposals of the Baton Rouge Electric Company and the Louisiana Steam Generating Corporation to dispose of their entire respective facilities, other than the bus properties and business of the Baton Rouge company, to the Gulf States Utilities Company in accordance with the terms and conditions set forth in applications filed with the commission on February 25, 1938. All three companies are subsidiaries of Engineers Public Service Company.

•

Texas Bureau Reports Increase in Power Output

Electric power consumption in Texas continued during June to show favorable comparisons with a year ago, according to the University of Texas Bureau of Business Research. Only in industrial consumption was the June figure below a year ago. But even industrial consumption during June was well above the preceding month and for the first six months it was moderately above that of the corresponding period last year.

Reports to the bureau from the seventeen principal power companies of the state, representing upward of 80 per cent of the electrical energy produced, show total June production 1.8 per cent above a year ago and 5.8 per cent above the preceding month. Total consumption during the first six months was 6.4 per cent over that of the similar period a year ago.

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Court Reserves Decision in Associated Gas Case

Federal Judge John W. Clancy has reserved decision on motion of the SEC that Associated Gas & Electric Company be enjoined temporarily from continuing to offer to exchange 5½ per cent convertible investment securities due November 15, 1938, for similar issues due 1939 and 1943, with certain bonus inducements.

SEC asks that the temporary injunction be made effective until Associated shall have filed a registration statement for the extension of maturity of the investment certificates under Section 5A of the Securities Act of 1933 and made a declaration of the extension under Section 7 of the Public Utility Act of 1935.

•

Asks Bonneville Units Bid

The United States engineer office at Bonneville, Ore., has asked for bids on September 13 on two 74,000-hp. Kaplan turbines and governors, imbedded parts for two more units and for the power house building addition for the four units. The initial two units at Bonneville are 60,000 hp. The new units are 75 r.p.m. with 175 r.p.m. half-hour runaway. Woodward Governor Company's cabinet type dual valve unit actuator or equal is specified.

•

Quebec Plans Hydro Project

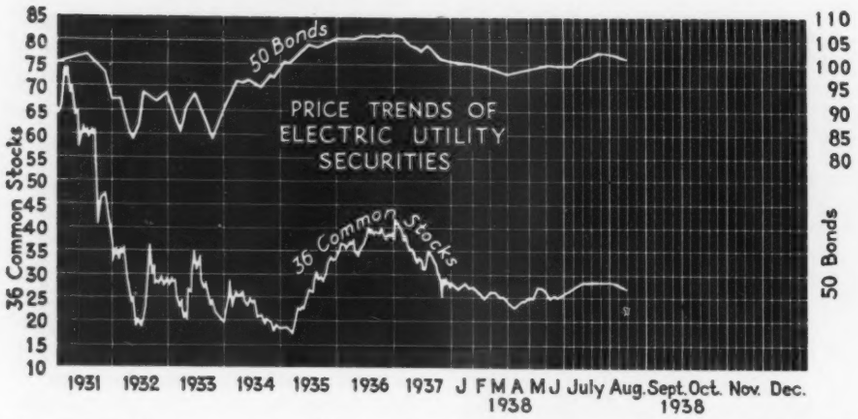
Quebec's National Electricity Syndicate, provincial governmental body charged with directing state development of power in Quebec, has ordered construction of a dam on the Upper Ottawa River to provide for the development of 35,000 hp. This is the syndicate's first development since its acquisition of water development rights recently from the Noranda Power Company.

•

Industrial Use Declines

Urban home use of electricity in Wisconsin increased 15 per cent in May over the same month last year, rural use increased 30 per cent, government use gained 3 per cent and business and industrial use dropped 14 per cent, according to the state Public Service Commission's utility rates and research department.

Utility Stocks and Bonds Hold Levels


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1938
1938

The past week was an uneventful one for electric utility securities, both stocks and bonds remaining relatively unchanged. "Electrical World" stock index dipped 0.1 point to 27.7; index a year ago, 34.4. "Electrical World" bond index gained 0.1 point to 102.2

Columbia Gas Moves to Cut Stock Value

Steps have been taken by Columbia Gas & Electric in accord with recommendations of SEC to reduce the stated value of its capital stock and thereby provide a reserve to absorb probable writedowns of investments in subsidiaries. This action will pave the way for resumption of dividends on its common stock.

Cincinnati Gas & Electric, Columbia subsidiary, has sent to shareholders a proposal to restate the capital stock represented by its common stock for the purpose of creating a capital surplus of $22,500,000. Edward Reynolds, Columbia president, stated that this amount will be greater than the charges to surplus which will be necessary if all doubtful items in the capital account are eliminated. These doubtfuls include any values in excess of "original" cost.

The next step in the program will be the creation of surplus accounts by other subsidiaries and the elimination of suspected write-ups of $72,000,000 carried from books of predecessor companies so that the Columbia system will meet the objections voiced by the SEC in denying the company permission to declare a dividend on its common stock last April.

•

Commission Approves Edison Units' Financing Plans

New York Public Service Commission has authorized the Yonkers Electric Light & Power Company to issue not to exceed $9,515,000 of twelve-year 3½ per cent debentures due in 1950 and to be guaranteed as to principal and interest by the Consolidated Edison Company of New York, Inc.

The commission also authorized the New York and Queens Electric Light & Power Company to issue not to exceed 8,772 shares of preferred stock of $100 par value, to be sold at not less than par, to realize proceeds of $877,200. It also consented to the acquisition and holding of not to exceed 8,629 shares of preferred stock by the Consolidated Edison for a consideration of not less than $862,900.

•

Utility Offerings Total $84,000,000

Toledo Edison Company effected a reduction in interest charges and in mortgage debt with the offering this week of $30,000,000 first-mortgage 3½ per cent bonds due in 1968 and $6,500,000 of 4 per cent sinking-fund debentures due in 1948. The bonds were offered at 101½ and the debentures at 100¾.

Proceeds from the sale of these securities will be used, together with cash on hand, to redeem on or about October 13 next $27,500,000 of first-mortgage 5 per cent bonds and to pay $7,550,000 of secured, unsecured and demand notes and bank loans incurred by the company in making recent property additions and acquiring new properties. The rest will be applied to payment of interest overlap, and the remainder, if any, will be added to working capital.

Public Service Electric & Gas Company, Newark, N. J., made an offering of first mortgage 3¼ per cent bonds to the amount of $10,000,000.

Indianapolis Power & Light Company first mortgage 3¾ per cent bonds, due August 1, 1968, to the amount of $32,000,000 have been offered the investing public and $5,500,000 of serial notes, due August 1, 1939.

Net proceeds from the sale of these securities, together with an estimated amount of $2,558,750 of other funds of the company will be deposited in trust by the company for the redemption on or about October 11 of the outstanding $37,509,000 of first mortgage 5 per cent bonds, series A, due January 1, 1957, at 104 and accrued interest.

•

Standard Gas Released

A decree was entered recently by the District Court of the United States for the District of Delaware at Wilmington terminating and finally closing, subject to certain reservations, the proceedings for the reorganization of Standard Gas & Electric Company under Section 77B of the Bankruptcy Act. These proceedings have been pending in that court since 1935.

•

FPC Authorizes Note Issue

Upon application filed July 11, the FPC has authorized the Nevada-California Electric Corporation, Riverside, Calif., to issue to Bank of America National Trust and Savings Association its promissory note in the principal sum of $700,000. Bearing 4½ per cent interest and maturing in three years, this note is to be amortized in montly installments of not less than $20,000 each. It is secured by a collateral agreement providing for pledge of the corporation's term-payment electric appliance sales contracts for not less than 143 per cent of the unpaid balance due. Proceeds will be used to refund outstanding notes and for other corporate purposes.

Earnings Reports (Utilities)

	Net Income 1938	1937
*Electric Bond & Share	$10,113,865	$10,017,399
*American G. & E. and subs.	11,998,007	12,783,501
*Engineers Pub. Serv.	3,648,898	3,203,755
*American Lt. & Trac. and subs.	5,050,086	5,998,484
*New England Pwr. and subs.	4,615,789	6,424,987
‡Standard G. & E. and subs.	2,700,118	4,744,017
*American Wat. Wks. & E. and subs.	2,368,681	4,914,187
*Cons. G. E. L. & P. Balt. and sub.	5,953,757	6,471,120
†Commonwealth Ed. and subs.	9,487,422	7,831,954
†Pub. Serv. North. Ill.	1,844,995	2,690,115
*Virginia Elec. & Pwr.	3,343,864	3,313,568
*Puget Sound Pwr. & Lt. and subs.	910,735	1,275,421

*Twelve months ended June 30.
†Six months ended June 30.
‡Twelve montss ended May 31.

Puget Sound Power Honors "Old Timers"

Some three hundred "old timers" of the Puget Sound Power & Light Company recently gathered in Seattle at the invitation of President Frank McLaughlin for their third annual celebration, at which they initiated 30 green-capped "freshmen" who had just completed their first 25 years of Puget Power service.

President McLaughlin himself donned one of the green caps, denoting completion of his 25 years of service with the Puget Power group of utilities, seven of which have been as chief executive of the Puget Sound company.

Symbolizing the group of employees with longer service than a quarter of a century was Francis Lester Wyman, who was acclaimed for his 48 years of "faithful, loyal service to the company and the public which it serves," as Mr. McLaughlin put it. Mr. Wyman started as a motorman on one of the first Madison Street cable cars in Seattle and is now in the Everett shops.

Other honors went to three "idea" winners who had submitted the most constructive ideas for the advancement of their particular departments in the preceding year—John Craig in the operating, E. W. Whiting in the accounting and William Bonnett in the sales department. This year the Distinguished Service Medal was awarded to Tom Donovan, who led the rescue of Ensign Bruce, U.S.N., when the latter's plane plunged into Puget Sound last year. For this deed of heroism Mr. Donovan was commended also by Secretary of the Navy Claude Swanson.

In his speech at the close of the dinner President McLaughlin said the company's service to its more than 184,000 customers was in splendid condition and the company's friends were never more numerous or more vigorous in Puget Power's support. "We justify our position in the community and our standing only on a basis of merit in the service we provide," he declared.

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Approves Bonneville Pact

FPC has announced its approval of the temporary and experimental rate schedule incorporated in a contract dated July 26, 1938, executed between J. D. Ross, Administrator of the Bonneville project, and the Northwestern Electric Company, covering the sale and disposition of power from the Bonneville project for a period not to extend beyond October 31, 1938. This is the first contract covering the sale of Bonneville power submitted to the commission.

"OLD TIMERS'" DINNER—President Frank McLaughlin of the Puget Sound Power & Light Company, right, congratulates Francis L. Wyman on his 48 years of "faithful, loyal service to the company and the public which it serves"

State Board Splits on Consumers Plan

Michigan Public Utilities Commission has decided to hold a hearing on a recent petition of the Consumers Power Company, which seeks to liberalize requirements for building rural power lines. Decision to hold the hearing was made after the commission came to the conclusion that Joseph M. Donnelly, one of its five members, had spoken hastily when he praised the proposed liberalization program.

On the day the Consumers Power Company filed its petition to construct rural lines if guaranteed a minimum monthly income per mile of $12.50 Commissioner Donnelly said the plan " . . . is welcomed by this commission. The new policy of the Consumers Power Company is an advance which should be commended."

Two days later, however, a statement over the name of C. J. Winder, chief engineer of the commission, characterized the plan as "unfair," and as one which "will lead only to bitter disappointment on the part of the farm population . . ." He stated the proposed plan, rather than lowering rural costs, would increase them.

In a formal press statement the commission noted that Commissioner Donnelly had approved the plan "with qualifications," but that "in view of the possibility of inducing the company to make further concessions," he would agree to hold a hearing on the matter. Chief Engineer Winder stated that less investment was required on the part of the company to connect one customer than to connect two or more. If the company were willing to build a mile of line for a minimum guarantee of $12.50 for five customers, he said, the rates for fewer customers should be: Four to the mile, $11.50; three to the mile, $10.50; two to the mile, $9.50; one to the mile, $8.50.

The day following submission of the Consumers' Power plan, REA authorities in Washington announced $2,070,000 in grants to Michigan co-operatives for construction.

•

Asks Bids on REA Project

Bids will be taken August 25 at Overton, Nev., for the construction of the Overton power district No. 5 REA project, involving the building of a 750-kva. substation, 24 miles of 69-kv., three-phase transmission line and 60 miles of 7.2-kv., single-phase distribution lines. Also included will be 140 distribution transformers which will provide service to 370 customers. The district has an REA allotment of $168,000.

•

Arkansas Line Approved

Application of the Oklahoma Gas & Electric Company and the Southwestern Gas & Electric Company for authority to build an electric transmission line from Fort Smith, Ark., to Fayetteville, Ark., has been granted by the Arkansas Utilities Commission. The 47-mile line would be a "stand-by" or emergency circuit and Southwestern Gas will pay $215,000 of the construction costs and Oklahoma Gas $140,000.

Southern Section of A.I.E.E. to Meet

Between two and three hundred members of the Southern division of the American Institute of Electrical Engineers are expected to attend the annual convention at Coral Gables, Fla., November 28-30, according to Stanley Warth, secretary of the division.

The group also hopes to attract refrigerating and ventilating engineers from the southeastern section of the United States to the three-day session, over which Edwin B. Wood, vice-president of the Southern section, will preside.

Committee chairmen named are: W. Austin Smith, committee on papers; J. B. Hiers, Jr., finance; J. C. Jones, program; J. D. Preston, attendance and publicity; P. J. Carlin, transportation, and Ralph Y. Pool, entertainment.

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Municipal Signal Group Announces Fall Meetings

The 43d annual meeting of the International Municipal Signal Association, Inc., will be held at the Lord Baltimore Hotel, Baltimore, Md., September 12-15. Leading municipal signal engineers from all parts of the country will be in attendance and there will be a program of talks covering all phases of municipal signaling work and exhibits by leading manufacturers in this field.

Announcement has been made that the New England section of this association will meet at the Hotel Raymond, Fitchburg, Mass., October 19-20. R. J. White, Brockton, is secretary, and George H. Bowen, Boston, is chairman of the program committee.

•

Sections Meetings Planned by Wisconsin Association

Announcement has been made that the commercial and technical divisions of the electric section of the Wisconsin Utilities Association will hold their annual convention October 24 and 25 at the Schroeder Hotel, Milwaukee. Plans call for one joint session, at which subjects of interest to both commercial men and engineers will be presented, with the three other sessions conducted separately by each division. There will be no manufacturers' exhibit in connection with this year's gathering.

John I. Allen, Wisconsin Gas & Electric Company, Racine, has been named chairman of the nominating committee of the association's accounting section, which will meet September 23 and 24 at Lawsonia, Green Lake. Serving with Mr. Allen on this committee are R. H. Macke, Wisconsin Public Service Corporation, Oshkosh, and J. E. Gray, Wisconsin Power & Light Company, Madison.

Meetings

World Power Conference—Vienna sectional meeting, August 25–September 2. Executive committee, U. S. National Committee, World Power Conference, 4 Irving Place, New York, N. Y.

Rocky Mountain Electrical League—Annual meeting, Canyon Hotel and Lodge, Yellowstone Park, Wyo., August 29–31. George Lewis, managing director, Gas and Electric Building, Denver, Colo.

Illuminating Engineering Society—Annual convention, Nicollet Hotel, Minneapolis, Minn., August 29–September 1. A. D. Cameron, general secretary, 51 Madison Avenue, New York, N. Y.

International Association of Electrical Inspectors—Eastern section, Hotel Lord Baltimore, Baltimore, Md., September 6–8, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern section, George Washington Hotel, Jacksonville, Fla., September 12–14, Joseph Whitner, secretary, P. O. Box 1743, Atlanta, Ga. Western section, Hollenden Hotel, Cleveland, Ohio, September 19–21, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Northwestern section, Hotel Spokane, Spokane, Wash., October 3–5, F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern section, Hotel Lafayette, Long Beach, Calif., October 10–12, H. L. Gerber, secretary, 205 City Hall, San Francisco, Calif.

Pennsylvania Electric Association—Annual meeting, Bedford Springs Hotel, Bedford Springs, Pa., September 7–9. Harold A. Buch, secretary-treasurer, Telegraph Building, Harrisburgh, Pa.

Maryland Utilities Association—Fall convention, Ocean City, Md., September 9 and 10. Warren D. Haley, secretary, Takoma Park, Md.

National Electrical Contractors Association—Annual meeting, Book-Cadillac Hotel, Detroit, Mich., September 12–15. L. W. Davis, general manager, 420 Lexington Avenue, New York, N. Y.

International Municipal Signal Association—Annual meeting, Lord Baltimore Hotel, Baltimore, Md., September 12–15. Irvin Shulsinger, secretary, 7 East 42d St., New York, N. Y.

Empire State Gas & Electric Association—Annual convention Lake Placid Club, Lake Placid, New York, September 15-16. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

Wisconsin Utilities Association—Transportation section, Lawsonia, Green Lake, Wis., September 19–20; accounting section Lawsonia, September 23–24; electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., October 24–25. A. F. Herwig, executive secretary, Brumder Bldg., Milwaukee, Wis.

Indiana Electric Association—Annual convention, French Lick, Ind., September 29–October 1. Tom C. Polk, secretary, 607 Traction Terminal Bldg., Indianapolis, Ind.

American Transit Association — Annual meeting, Toronto, Canada, October 3–6, Charles Gordon, managing director, 292 Madison Avenue, New York, N. Y.

National Safety Congress—Silver Jubilee, Stevens Hotel, Chicago, Ill., October 10–14.

Ordered to Remove Lines in Seaford

Delaware Supreme Court, Dover, has handed down a decision directing the Eastern Shore Public Service Company, Salisbury, Md., to remove its distributing lines and equipment from Seaford, Del., in accordance with an order of the Seaford Town Council made in 1936, when a twenty-year franchise was given to the Seaford Power & Light Company, organized at that time.

Action protesting the order has been in the state courts since that period and the recent decision upholds a ruling of the Chancery Court rendered about a year ago. Under its contract with the Seaford company the town has the privilege of purchasing the power plant which was built and the new distribution system for operation as municipal property.

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Flathead Project Transfer Authorized by Commission

Transfer from the Rocky Mountain Power Company to the Montana Power Company of the license for the Flathead project, located on Flathead Lake and River, Montana, has been authorized by the FPC.

The commission's action was taken after a finding that the Montana Power Company has assumed the obligations of the Rocky Mountain Power Company and complied with certain conditions specified in the commission's order of May 18, 1938, which granted approval of the transfer subject to compliance with those conditions.

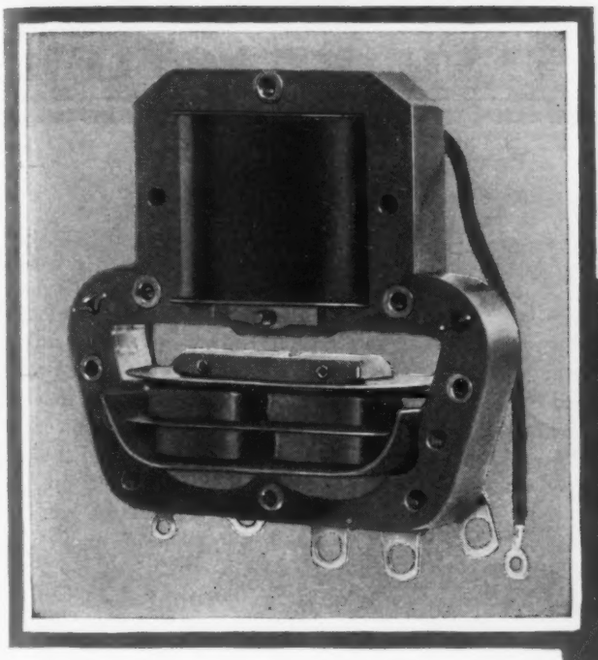
Concurrently with its order authorizing the transfer of license, the commission dismissed a petition filed by Logan W. Marshall of Sidney, Ohio, asking that the commission reopen proceedings with respect to the application for transfer and deny the application of the two corporations.

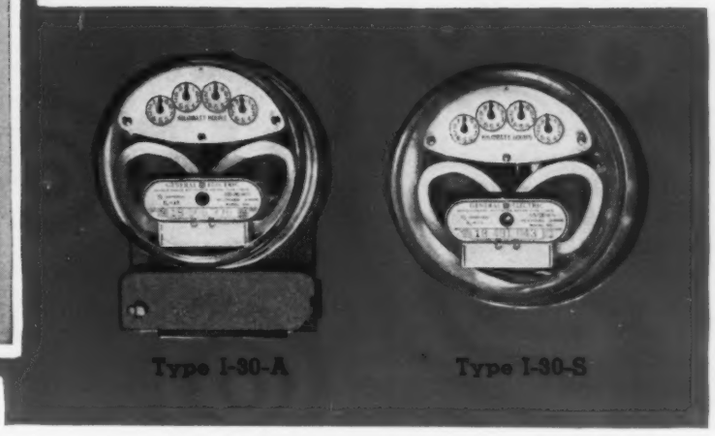
•

Rubber and Plastics Group

That applications of rubber and plastics are rapidly forging ahead is clearly evidenced by the attention now being given to these materials. Indicative of the trend, the American Society of Mechanical Engineers recently established a committee, or subdivision, on rubber and plastics which will deal with several phases of these industries, including mechanical applications, research on basic mechanical properties, processing equipment and standards. A symposium on rubber is included in the next meeting of the society, at Providence, R. I., October 5-7.

THIS ELEMENT "*Makes*" the WIDE-LIMIT METER





THE driving element of the G-E Type I-30 watthour meter, more than any other feature, makes possible the straight-line characteristics between the wide-apart limits of 0.5 and 60 amperes.

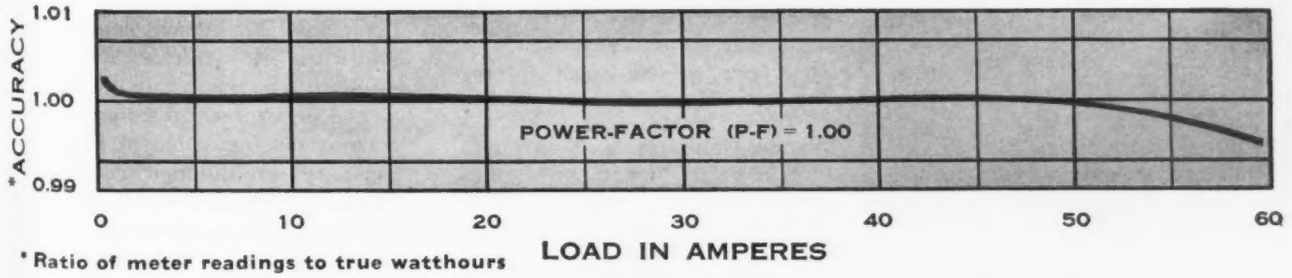
First of all, the I-30 meter—even when uncompensated—is remarkably accurate. It is the driving element that contributes most to this inherent accuracy. As a result of its fundamentally correct design, the errors caused by variations in load, voltage, temperature, power-factor, and frequency are negligible, and only slight compensations are needed.

The load shunt, which is incorporated as a part of the driving element, not only compensates for heavy-load droop, but also improves performance at light loads, so that the resulting load curve is accurate to lower values of current.

Other refinements in design—such as new light-load and lag adjustments and compensation for Class 1 and Class 2 temperature errors—add to the ability of the I-30 meter to handle accurately loads that vary widely, and help toward making it suitable for very broad applications.

If you should like to know more about the I-30, we shall be glad to send a copy of Bulletin GEA-2721. Or you may prefer to call in a G-E meter specialist. Address the nearest G-E sales office, or General Electric Company, Dept. 6—201, Schenectady, New York.

AVERAGE LOAD CURVE OF 15-AMPERE, 240-VOLT, 3-WIRE, 60-CYCLE, TYPE I-30 WATTHOUR METER



* Ratio of meter readings to true watthours

GENERAL ELECTRIC

400-29

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Record Drawings on 35 Mm. Film

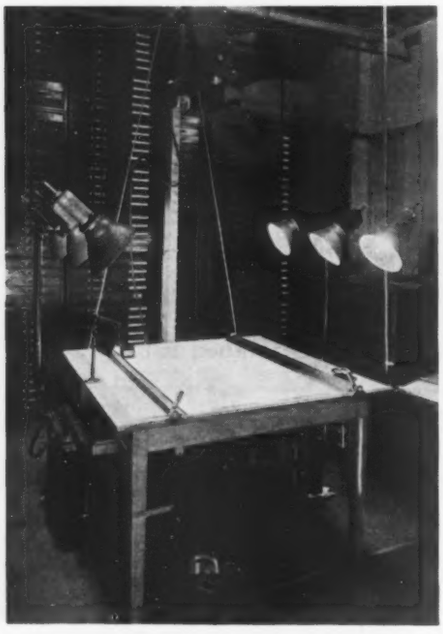
Under a new system in use in the drafting and surveying bureau of the Detroit Edison Company thousands of drawings, prints and other reference material are being photographed on 35-mm. fine-grain film for active reference and the original material relegated to dead storage. Enlarged images of the drawings are projected from the film for study or reproduction as needed with the aid of equipment specially designed for that purpose. Substitution of the photos for the file of drawings has effected a saving in space of 1,000 sq.ft., which is about one-quarter of the total storage space. All the films can be filed in one filing cabinet of the size used in the average office.

Experience established the practical limit of reduction of drawings at 24 to 1, which permitted the original drawings to be recorded satisfactorily on 35-mm. film. Photographing was done with a camera holding 100-ft. reels (700 exposures), mounted on a vertical post above a flat table on which the illumination intensity is about 50 ft.-candles. An inverted light meter mounted on the table determines the light reflected from the work. Production averages 1,400 photographs a day. Records show a high of 2,801 in one day.

With the assistance of the Eastman Kodak Company and the Photostat Corporation, an ingenious device was developed which projects an enlarged image from the film directly on the bureau's photostat machine. Maximum size of the prints produced is 18 x 24 in. Since most of the original drawings are 30 x 42 in., this method prints them about half size. This was found large enough for most reference work.

Should a draftsman wish to consult a drawing or take off a detail full scale a projection desk—the only one of its kind so far built—is used. This desk, made by Recordak, is shown in the accompanying illustration.

The drafting and surveying bureau has photographed 100,000 drawings and blueprints and 270,000 bills of material sheets with this equipment. The total area the finished films occupy is less than 1 per cent of the space formerly required for the drawings.



Equipment for photographing engineering drawings on 35-mm. film

Drawings are placed on the table under two straight edges to hold down the curl. Pressure on the foot pedal exposes the film and positions the drawing for the next shot.

Detroit Edison Company—Synchroscope

Desk for projecting image of drawing from 35-mm. film for tracing or reference

Depressing the pedal bar turns on the projector light. With the films inserted at the back the operator turns the crank in front until he finds the print sought. An image is thrown on a mirror in the bottom of the desk surface and from there reflected to the desk surface, which is made of clear glass plate. Placing a thin screen of semi-transparent plastic material on the glass surface intercepts the light and shows the image. For tracing a print or detail the plastic is replaced by tracing paper laid directly on the glass.

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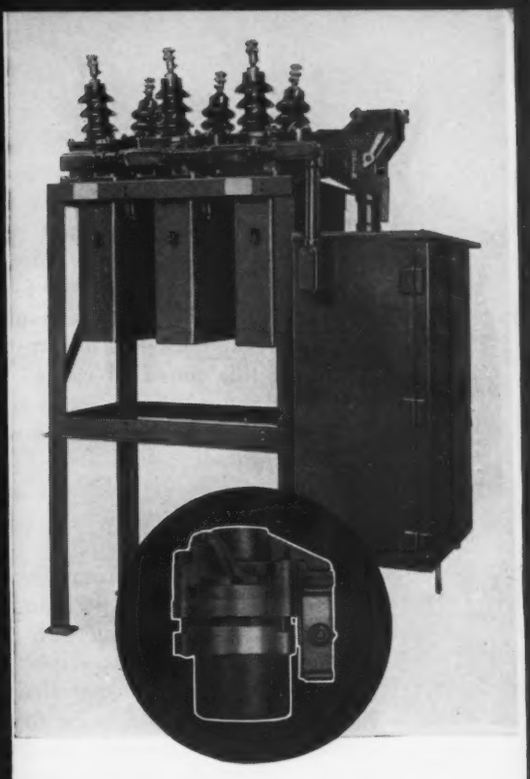
Throw-Over Switches Improved in Service

By LUDVIK J. JEHLICKA
Commonwealth Edison Company, Chicago

Automatic switches, used by the Commonwealth Edison Company on four-wire, 4-kv. services for throw-over to emergency supply from a second line, present distinctive maintenance and inspection problems because they are different from the ordinary oil circuit breaker in design and are usually installed out of doors on pole tops exposed to extremes of heat and cold in summer and winter weather. In times past considerable trouble on these switches was experienced with the relays which were

CIRCUIT BREAKER *insurance!*



RUPTORS ARE USED on this Type OZ-110, 600 ampere, 15 kv outdoor Oil Circuit Breaker with interrupting capacity of 100,000 kva, for greater efficiency.

Ruptors Extinguish Arcs FAST! Their "QUICK-QUENCH" Action CUTS Oil Carbonization and Contact Deterioration to a Minimum!

● Low cost insurance . . . pennies protecting thousands of dollars of investment . . . that's what you get when you install Allis-Chalmers Oil Circuit Breakers with Ruptors, in your high voltage systems.

For Ruptors extinguish arcs . . . *in split cycles!* Their "QUICK-QUENCH" action insures you against high maintenance costs. Contact replacements are reduced! Oil carbonization is cut to a minimum!

You're insured against high inspection costs, too. You get consistent operation without constant attention. Ruptors are easy to get at for inspection and maintenance. They don't waste the time of your maintenance men, as some other circuit breakers do. And Ruptors handle many more circuit breaker interruptions before they require inspection and renewal of oil or contacts.

More "Breaks" For Your Money! You get more than that when you specify Allis-Chalmers. All the benefits of Allis-Chalmers broad engineering experience are available to you. Tests and technical research in the laboratories of Allis-Chalmers and associated companies throughout the world are put to work to get you more "breaks" for your money.

Get the Whole Story on "QUICK-QUENCH" Action!

Find out about this low-cost insurance. Learn how "QUICK-QUENCH" action can give you higher interrupting capacities at a reduced premium in lowered maintenance costs. Let your Allis-Chalmers representative, in the district office near you, give you the whole story on "QUICK-QUENCH" protection!

SWITCHGEAR DIVISION

ALLIS-CHALMERS

MILWAUKEE·WISCONSIN

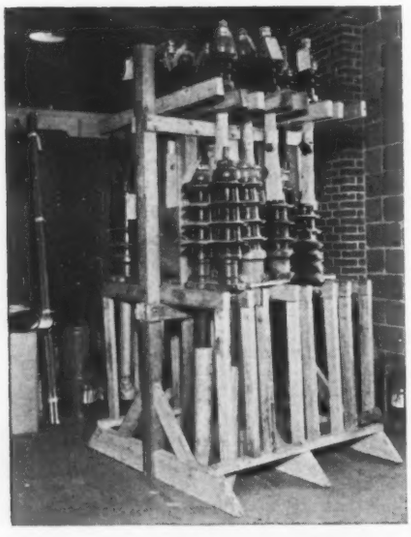
METALCLAD SWITCHGEAR • SWITCHBOARDS • OIL CIRCUIT BREAKERS • REGULATORS • MOTOR STARTERS • CUBICLES • SWITCH HOUSES

then inclosed in the potential transformer housing above the surface of the oil. Relay operation was unreliable because the contact points would sometimes stick. This was found to be caused by a sludge formation on the relay contacts resulting from oil evaporation in hot weather. Cure for this condition was to take the relay out of the potential transformer tank and to put it in a small cabinet by itself.

During extremely cold weather it was observed that the switch mechanism would sometimes fail to make a complete throw-over from the regular to the emergency position and the switch blades would not close solidly into the contact clips. This trouble was caused by congealed oils in the switch tank and in the mechanism housing. Probably the lubricating oil in the housing was the larger contributor to this trouble, but to take no chances a lighter insulating oil was put in the switch tank and at the same time the lubricating oil was changed for one with a lower pour point.

Sulphur was used in the early switches as a filling material in the porcelain bushings. It was soon found that sulphur in oil dissolves and softens, resulting in the formation of a thick sulphur deposit on all electrical contacts. It has been necessary to remove all loose sulphur from all bushing ends and seal them with a layer of oil-resisting cement.

BUSHING STORAGE RACK



This compact wooden rack accommodates 40 bushings (13 and 23 kv. rating) at the Tewksbury, Mass., substation of the New England Power Association system. It occupies a space 5 ft. long, 48½ in. wide and 8 ft. high. The rack is made up of five 3½ x 3½-in. vertical posts and three 2 x 6-in. bottom pieces, upon which are mounted cross and vertical members 2½ x 1½ in. Four central members 1¾ x 3½ in. are bolted between the vertical posts.

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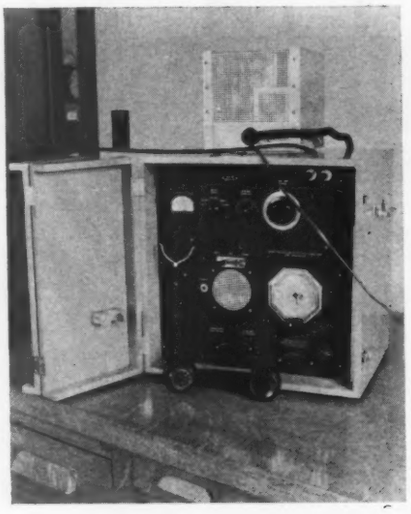
Western Utility Uses Two-Way Radio



Two-way radio used for emergency communication

Set with a. c. power pack on top. Space is provided at right edge of wood cabinet to carry log book. This equipment was made by Radio Specialty Manufacturing Company, Portland.

First utility in the far West and second in the United States to employ two-way radio for emergency communication with field men is the Northwestern Electric Company, Portland, Ore, which is completing tests with two portable sets operating simplex at 31,600 and 35,600 kilocycles. At 3 watts, for which the company is licensed by the Federal Communications Commission, the voice-modulated transmitters have operated between the company's headquarters in a Portland building and a point 17 miles away.

The sets are crystal-controlled, rated at 15 watts, contained in a single wood cabinet. The transmitter, with three radio-frequency and two audio-frequency modulator tubes, is mounted over the six-tube super-hetrodyne receiver. Operation is either through a 120-volt a.c. power pack or from a 6-volt storage battery. Fifteen-foot vertical antennas are being employed. Testing will go forward upon completion of a reflector radiator. This will replace the non-directive half-wave vertical radiator used so far.

Windows in Pipe Check Float Valves

By E. J. DREWLOW
Riverton Station,
Empire District Electric Company,
Joplin, Mo.

To lose water by overflow from the deaerator heater is particularly annoying in a plant like Riverton, because Riverton operates with 60 per cent make-up, and the water that gets away from the deaerator is what one might call more expensive than ordinary water because it has been treated with a variety of chemicals in order to make it acceptable to the boilers.

Therefore, as a constant check on the float valves in the deaerator heater, the overflow pipe is made transparent by setting windows in it at eye level above the boiler room operating floor. The windows, two of them set diametrically opposite in the pipe, are of "Herculited" heat-resisting glass about 4 in. high and 8 in. across. Part of the routine of the boiler room attendants is to give a look through the pipe at regular intervals.

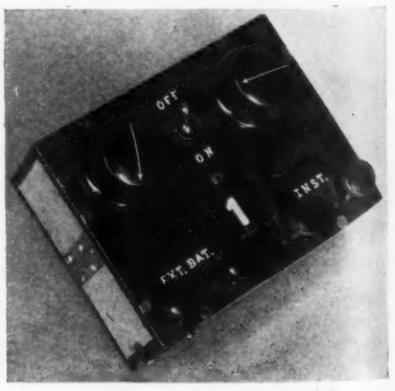
If there is any overflow from the deaerator it does not continue long before it is detected.

•

Aid for Calibrating D.C. Millivoltmeter

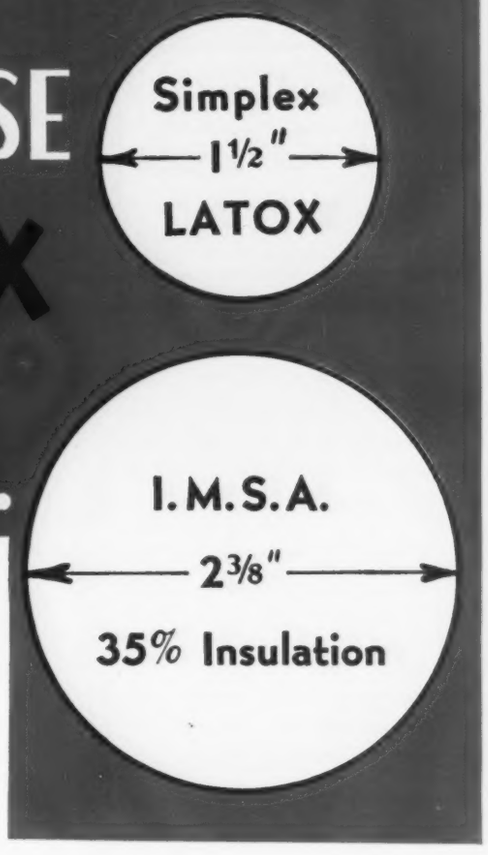
By ARTHUR W. WEEKS
Laboratory Edison Electric Illuminating Company of Boston

Switchboard direct-current ammeters frequently utilize a millivoltmeter which indicates the drop across a shunt of known resistance, and to calibrate it it is customary to check the instrument as a millivoltmeter,



Portable checking device for d.c. millivoltmeters

You SHOULD CHOOSE Simplex-LATOX CABLES . . .



If you need smaller cables

The two circles above represent a 127 conductor lead covered control cable. One is insulated with Simplex-LATOX, the other according to I.M.S.A. 35% rubber specifications.

Simplex-LATOX insulated cables are from 33% to 50% smaller than conventional cables. This remarkable reduction in size is possible because conductors insulated with LATOX have thinner walls of insulation.

If you need lighter cables

The smaller cables resulting from the thinner walls of LATOX and the lighter walls of lead naturally mean less weight. If you are crowded for space or if you have limited installation facilities then Simplex-LATOX insulated cables are just what you need.

If you want easier installation

Smaller size and lighter weight both mean easier installation. The small size means that the cable will go into places it would be impossible to put a conventional cable with the same number of conductors.

If you want good electrical properties

The electrical properties of Simplex-LATOX insulation are unexcelled. Due to its 93% rubber content, Simplex-LATOX has high dielectric strength, high insulation resistance, low specific inductive capacity and low power factor.

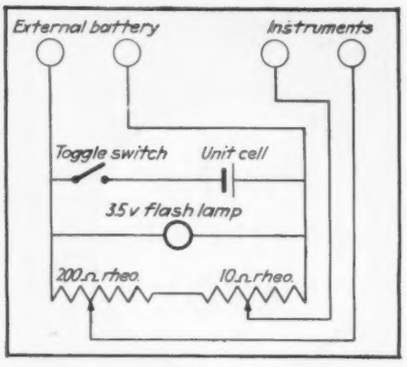
If you need control, signal or communication cables

Simplex-LATOX is the ideal insulation for modern communication, signal and control cables. For all such applications it combines the advantages of rubber and paper insulations yet exceeds but little the small diameter of dry paper insulated cables.

Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.

Simplex – LATOX

Thin insulation made directly from rubber latex



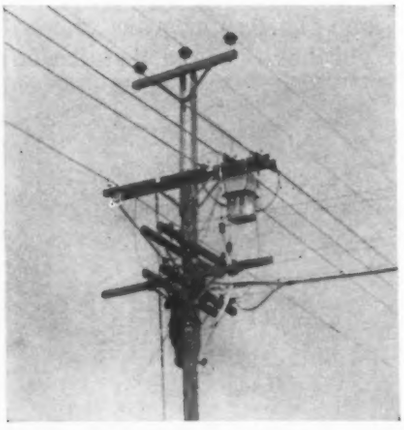
Circuit arrangement for millivoltmeter testing device

computing the calibration in amperes from the shunt data. For such calibrations it is necessary to provide a source of direct current which can be varied from a few millivolts to a volt or more. The adjustment must be in small increments over the entire range. Equipment to obtain this calibration voltage is likely to be rather bulky and require considerable set-up time by the test man. A convenient portable device for this work developed here weighs but 1.25 lb. and is mounted in a 2x4x5-in. case. The connections are simple, as shown, and the assembly material can be obtained in any radio supply store, viz.:

1 200-ohm radio rheostat
1 10-ohm radio rheostat
1 small "off and on" toggle switch
1 3.5-volt flashlamp
1 unit cell
4 insulated binding posts

The flashlamp serves as a pilot light and allows for the connection of three dry cells to the terminals marked "External Battery," should it be necessary to use more than the 1.2 volts supplied by the internal cell. The 200-ohm rheostat serves as a coarse control and the 10-ohm unit for fine control of voltage.

OPERATE BREAKERS FROM GROUND



Pole-top, sectionalizing, oil-circuit breakers on the system of the Nevada-California Electric Corporation can be opened or closed manually from the ground by means of a simple, steel-cord control arrangement. Two 3/16-in. galvanized sash cords pass downward from the breaker control arm through a 2-in. Transite conduit to a convenient height near the bottom of the pole. Strain insulators are cut in between the control arm and the upper end of the sash cords to insulate the cords. Upon emerging from the conduit at the lower end the cords are terminated in rings which can be padlocked to eyebolts set in the pole, to lock the switch in either the open or closed position. There are about 25 such installations on the system.

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*Secondary Distribution Economics**

III—Conductor Losses

By E. M. ADKINS
Jersey Central Power & Light Co.,
Asbury Park, N. J.

Energy loss per conductor in a section of a two-way secondary with laterals having a current I_1 passing through and a current I_2 distributed along its length may be expressed by the equation:

$$\text{Watts loss} = \left(I_1^2 + I_1 I_2 + \frac{I_2^2}{3}\right)R$$

As previously developed, the following relations apply to the symmetric circuit shown in the sixth installment of this series (July 2, 1938).

Two-Way Feed With Laterals

Distance AB = BD = BE = BC = AF = FH = FG = FJ

$$\text{Through Current A to B} = I_1 = \frac{3byD}{8{,}000}$$

$$\text{Distributed Current A to B} = \frac{I_1}{3} = I_2$$

$$= \frac{byD}{8{,}000}$$

$$\text{Conductor Resistance A to B} = \frac{byr}{8}$$

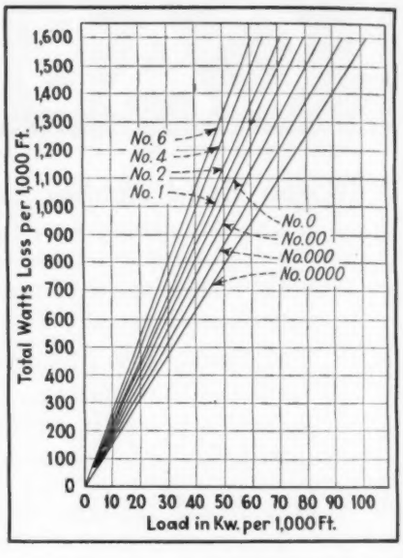
$$\text{Total circuit length} = T = by$$

Applying these relations, the total watts loss per current-carrying conductor may be expressed by the following equation:

$$\text{Watts loss} = 2\left[\left(\frac{3byD}{8{,}000}\right)^2 \frac{byr}{8} + \left(\frac{3byD}{8{,}000} \times \frac{byD}{8{,}000} \times \frac{byr}{8}\right) + \left(\frac{byD}{8{,}000}\right)^2 \frac{byr}{24} + \left(\frac{byD}{8{,}000}\right)^2 \frac{3byr}{24}\right]$$

$$= \frac{5b^3y^3D^2r}{96 \times 10^6} = \frac{5T^3D^2r}{96 \times 10^6}$$

substituting the value $T = \sqrt{\frac{8{,}000V}{Dz}}$ and allowing a 100 per cent factor of safety the total loss for the circuit is equal to



Conductor loss in watts per 1,000 ft. for single- and three-phase, two-way feed with laterals

$$\text{Total watts loss} = 5\sqrt{\frac{8{,}000V}{Dz}} \times \frac{8{,}000V}{Dz} \times \frac{D^2r \times 2 \times 2}{96 \times 10^6}$$

$$= \frac{5DVrT}{3z \times 10^3} \quad \text{for single phase and}$$

$$\text{Total watts loss} = 5\sqrt{\frac{8{,}000V}{Dz}} \times \frac{8{,}000V}{Dz} \times \frac{D^2r \times 2 \times 3}{96 \times 10^6}$$

$$= \frac{5DVrT}{2z \times 10^3} \quad \text{for three phase circuits.}$$

The energy loss per 1,000 ft. of secondary circuit is equal to the following:

$$w = \frac{1{,}000}{T} \times \frac{5DVrT}{3z \times 10^3} = \frac{5DVr}{3z} \quad \text{for single phase and}$$

$$w = \frac{1{,}000}{T} \times \frac{5DVrT}{2z \times 10^3} = \frac{5DVr}{2z}$$

for three-phase circuits.

The watts loss per 1,000 ft. of secondary circuit includes loss for each current-carrying conductor.

* Installment No. 9 in a series continuing in forthcoming issues.

BUILD LOAD PROFIT

DOUBLE YOUR **KWH** WITH LITTLE OR NO PLANT INVESTMENT BY ADDING **HOTPOINT ELECTRIC WATER HEATERS** TO RANGE CUSTOMER LINES.

Make domestic revenue even more profitable by adding Hotpoint Electric Water Heaters to the lines of your range customers

Electric Water Heating offers four distinct advantages to the utility company in search of profitable load.

1. It reduces load mortality — one of the worries of the operating company.

2. When installed for a range customer, the Hotpoint Electric Water Heater requires small additional wiring investment. It produces higher annual net revenue per customer.

3. Each Electric Water Heater contributes 2000 to 4000 KWH per year —double the domestic KWH consumption.

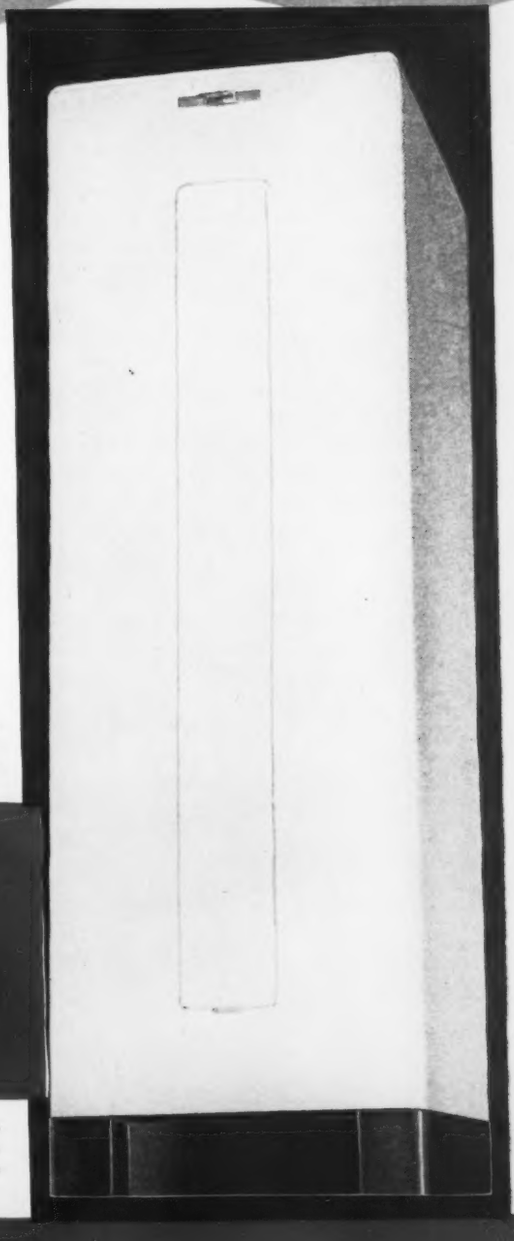
4. It provides a greatly improved load factor with practically no increase in plant investment.

Hotpoint, as the volume leader, offers the most complete line of Electric Water Heaters for off-peak or continuous service. In addition, Hotpoint's sales plans encompass complete programs for promotion, advertising, sales training and contests. Direct mail material, printed literature, posters and booklets which get business are all available.

Let the Hotpoint Water Heater specialist help formulate a plan for going after this profitable business.

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.
5618 West Taylor Street, Chicago, Illinois

CALROD — *(below)* Hotpoint's famous heating unit is immersed directly in the water within the storage tank. Delivers heat directly into the water.



THE VOGUE — *(right)* Hotpoint's smartly-styled rectangular type water heater, combining modern beauty of design with Hotpoint economy and efficiency.

ELECTRIC RANGES AND WATER HEATERS

IRONERS • SINKS AND DISHWASHERS

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Automatic Furnace Cuts Rejects to Zero

One-hundred per cent inspection of small, stamped, comptometer parts that are stress-relieved and tempered in the Micromax-controlled Homo electric tempering furnace used by the Felt & Tarrant Manufacturing Company, Chicago, now reveals a product that is so uniform as to be practically free from rejects. Difficulties in accurately controlling temperature in the previously used furnace resulted in a rejection rate which, though not excessive, was higher than was deemed necessary.

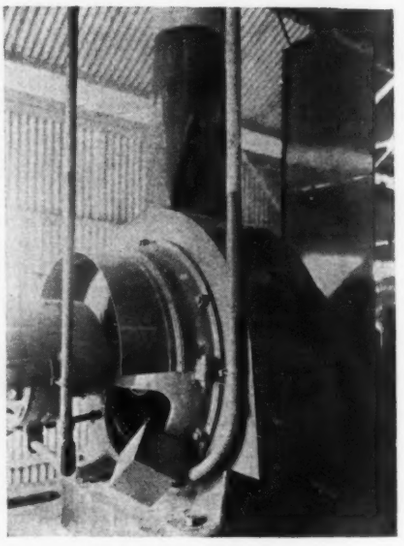
Parts charged into the tempering furnace have had a small section hardened by holding momentarily in a lead pot. The electric furnace tempers the hardened section and relieves the stresses set up in the unhardened section by the punching and forming operations. Since the parts are small and may make up a closely packed charge, a forced convection furnace was deemed necessary to obtain the desired uniformity.

The furnace, which is rated at 12 kw., operates on 220 volts, single phase, at any temperature up to 1,200 deg. F. An automatic pyrometer control maintains temperatures by a simple on-off switching arrangement. A temperature-limit fuse provides the necessary overheat protection.

•

Cool Fanless Motors by Chimney Draft

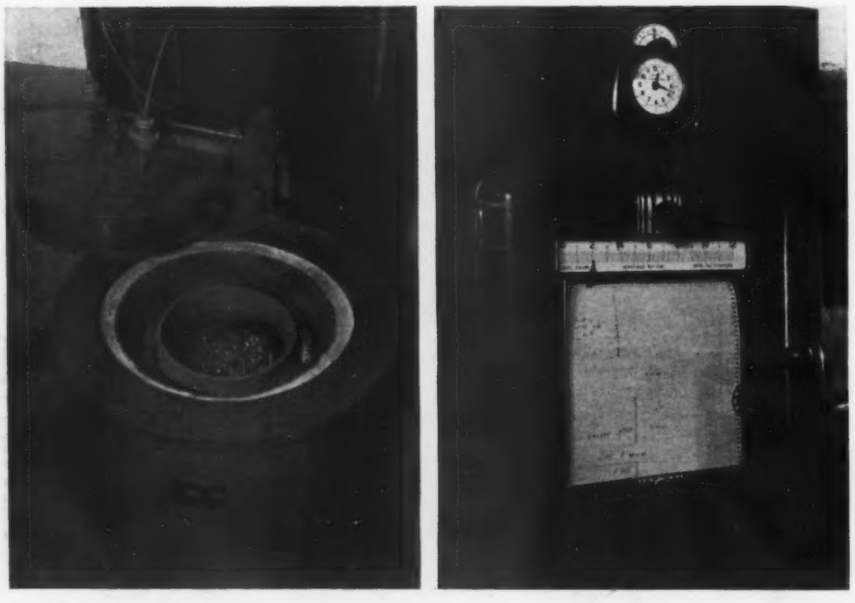
An unusual cooling scheme employed by the Tidewater Associated Oil Company has substantially increased the efficiency of a battery of 350- and 500-hp. motors driving centrifugal cooling water pumps at its Avon, Calif., refinery.



Fanless motors, cooled by chimney, have high efficiency

It was found that the standard rotor fan of a 500-hp. motor consumed 2½ hp. By ordering the motors without fan, cutting an opening in the top of the case and erecting a sheet-metal chimney over each motor from this opening the motors can be operated at full load continuously without noticeable temperature rise. The energy saved by this scheme on one 500-hp. motor, operating continuously through a year at full load, amounted to 14,700 kw.-hr.

The units have operated entirely successfully under this cooling system. They are 2,200-volt, three-phase synchronous motors and show the following efficiencies at full load: 97.3 per cent for the 500-hp. motors; 96.6 per cent for the 350-hp. motors.



Automatically controlled Homo tempering furnace produces clean uniform machine parts with a minimum of rejects. At right—Recording controller

LIGHT INCREASES NIGHT PRODUCTION

Westinghouse photo

White paint and 21 mercury incandescent lighting units yields a uniform illumination level of 21 ft.-candles in the new Los Angeles shop of the Christie Machine Works. Since the installation was made the shop has been working 24 hours a day instead of eight and company officials credit a good portion of the 33 per cent higher production record by night-shift work over daytime work to improved lighting.

Trace Phase Reversal To Capacitor Action

By W. A. THOMAS
Consulting Engineer, Scranton, Pa.

A development that arose as the result of an installation of 100 kva. of capacitors for power-factor correction occurred recently at the Jessup, Pa., mines of the Pompey Coal Company during a period when the colliery was idle. An attempt was made to start a 250-hp. compressor without success—a small motor was tried and it started backward.

After a thorough investigation the local power company assured the company that an open phase did not exist on the utility system. It was found, however, that one of the wooden rods of the incoming oil circuit breaker was burned off, causing an open phase in the mine system.

At first the reversal of one phase with a line phase open was puzzling. It was found, however, that there were three banks of transformers in the system, all connected 4,000 volts Y on the primary side and 460 volts delta on the secondary side. The 100-kva. condenser was connected in the secondary side of one of these banks of transformers.

From these facts it was obvious that the capacitors excited the open phase at 180 deg. from its normal position, which made it possible to start the small motor, but in the wrong direction. It would not give enough power, however, to start the larger motor.

To safeguard against recurrence of such a condition it was first suggested that a balanced current relay be installed on the incoming side to operate a low-voltage trip on the main circuit breaker, possibly with a time relay on the two-voltage trip if the supply is subject to surges.

The condition developed, however, when the colliery was idle, but when the three banks of transformers were excited. In this case, therefore, the current values were very low and it is questionable if the unbalanced current value would be sufficient to actuate the balance current relay.

It would then appear that the best protection would be obtained with a balanced voltage relay or phase reversal relay, since the open phase would be reversely excited and impedance drop of the other banks of transformers would reduce the voltage in the open phase.

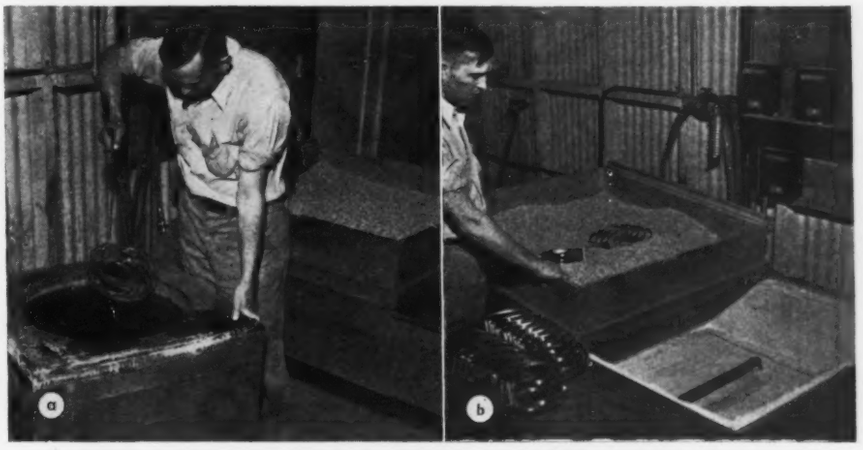
•

Sawdust Drying Box Heated Electrically

By extending its electrical applications to include water-rinse heating, sawdust drying, oil heating and finish drying Troendly & Plummer Wood & Metal Company, Culver City, Calif., has attained the low production costs usually associated with large scale enterprises.

Sawdust is employed for drying the plated metal accessories for the glass tableware that this firm manufactures. This is contained in a 3x3-ft. bin 8 in. deep that rests over an asbestos-lined wooden frame containing a 750-watt strip heater. Plated metal products from the adjacent 35-gal. electrically heated water-rinse tank, maintained at 180 deg., are transferred to this sawdust bin for drying. Heat from the strip unit evaporates the water which the sawdust takes from the metal and also accelerates the drying.

While the plant is running the heater operates continuously. Its monthly consumption is 126 kw.-hr. for five eight-hour days per week. Tests of the thermostatically controlled unit in the water-rinse bath indicate an average monthly consumption of about 160 kw.-hr.



Warm sawdust speeds drying of plated parts

(a) Plated metal parts rinsed in the electrically heated water bath (shown) are transferred to electrically warmed sawdust bin in the background for drying. (b) Sawdust bin moved aside to show underlying strip heater that keeps it warm.

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Regulator Utilizes Simple Liquid Brake

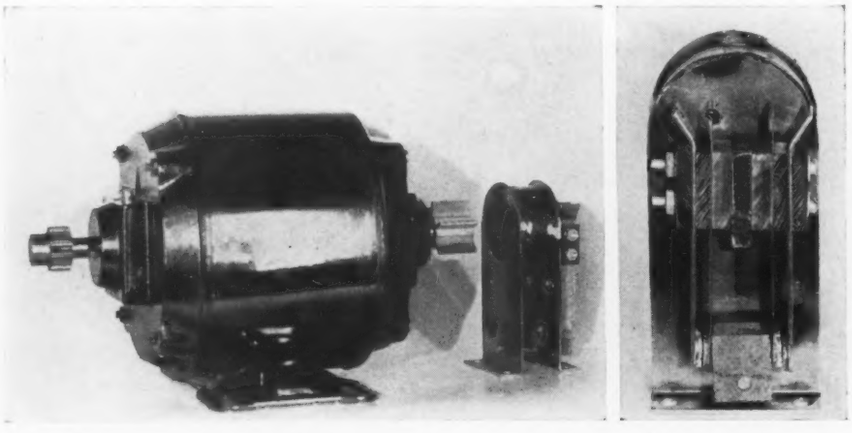
By L. G. TUBBS
Regulator Engineer
Westinghouse Electric & Manufacturing Co.,
East Pittsburgh, Pa.

A modification of the "liquid brake" frequently used in small rural-type regulators to cause the submerged operating motor to stop quickly after power is disconnected has been applied to high-speed, high-capacity regulators with the addition of a pressure switch to apply dynamic braking. A small friction brake constantly applied by means of a spring also helps materially to absorb the remaining motor inertia after its speed becomes low. These factors, even on a comparatively high-speed regulator, stop the motor quickly enough to give satisfactory operation with the closest relay settings likely to be used in service.

Application of reverse power for stopping the motor is accomplished by a special contact device mounted beside the motor and controlled by its rotation. An impeller on a shaft extension of the motor actuates a contact device which is mounted over the impeller and forms a casing around it. Rotation of the impeller produces an oil pressure against a movable vane in the contact device, moving it in a direction depending on the rotation of the motor. Motion of the vane, in either direction, closes one or the other of two sets of contacts. With the motor stationary the vane is held in a neutral position and both sets of contacts are open.

Each of the motor-starting contactors is provided with a back contact that is normally closed when the front contact is open and open when the front contact is closed to operate the motor. For a given direction of rotation the back contact is connected in series with one of the two sets of contacts in the impeller-controlled contact device (the pair that are closed for the given direction of rotation). A connection is made from the power supply through these two sets of contacts to the motor lead in a manner that gives rotation opposite to that which the contactor controls. This connection forms the braking circuits.

When the motor runs, the impeller-controlled contacts close, but the back contact on the relay opens. Thus no braking power is applied while the motor is operating. When the motor-starting contactor drops out its back contact is made, completing the braking circuit. With the braking circuit closed the motor is brought quickly to a stop. As soon as the motor approaches zero speed the impeller-controlled contacts open, interrupting the braking circuit and leaving the motor stationary.



Impeller-operated contact device applies dynamic braking to regulator motor

Contact device on right is mounted over the shaft-mounted impeller. Depending on rotation, a vane-operated switch (details seen at right) correctly applies dynamic braking. The device operates under oil.

•

Test Machine Yields Life of Cord Sets

Ability of cord sets for flatirons and other heating devices to withstand strains in torsion is measured at Electrical Testing Laboratories, New York City, by the illustrated torsion test machine. The machine measures life of the sets under repeated cycles of twisting and untwisting.

Experience has shown that a predominating type of failure in cord sets consists of open circuit or short circuit of the heater cord just inside the heater plug. Tensional and torsional stresses applied in service tend to cause early failure of the cord

Kearney Quik-Action Fitall Fuse Links are individually tested and inspected before being packed for shipment in sturdy, labeled cartons as shown.

Assure A Balance Between Continuity of SERVICE *and* ~ PROTECTION *with* KEARNEY *QUIK-ACTION* FUSE LINKS

YOU WANT a fuse link to *blow* where there are values of current and time which will damage or destroy equipment...of course, where values of load are such that they can be carried continuously, without damage to distribution equipment, you don't want a fuse to blow.

Careful engineering research has developed such fuses—fuses which establish a reasonable balance between the factors of protection and continuity of service.

The right Kearney Quik-Action Fitall Fuse Link in its proper place is a worthwhile investment, giving returns in absolute protection, or any degree of partial protection, which may be desired. Specify Kearney and see the profitable protection they give you.... Plus continuity of service.

Our Offer...

We guarantee Kearney-Quik Action Fitall Fuse Links to be within plus or minus 10% of current values — usually within plus or minus 5%. And Kearney Quik-Action Fuse Links cost no more than ordinary links.

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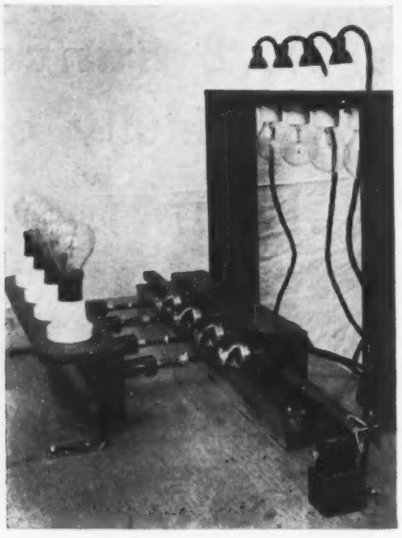


Device measures ability of heater cords to withstand repeated twisting

The lamps shown above give visual indication of failure of the cord by open or short circuit. Wiring is such that the lamps in both groups light at half voltage, while the cord remains in normal condition. In case of short circuit one lamp in each group burns brightly: open circuit causes two lamps in each group to become de-energized.

within the plug where it has been disarranged in the assembly operation.

In the device illustrated four specimens of an assembled cord set are tested at a time. The heater plugs are attached to flatiron terminal studs that are mounted in a suitable holder. The cords are threaded through a clamping device that oscillates on its central axis through about one full turn on each side of a central position at a rate of about 30 complete oscillations per minute. Since the cord is clamped only a short distance away from the heater plug, torsional stresses originating at the clamp are transmitted through the cord to the vulnerable area within the plug. Twisting of the cord results in some shortening that causes tensile stresses to be produced. These stresses tend to bring out any tendency of the covering materials of the conductors to pull back and leave the copper conductors exposed over a greater length than is necessary for attachment. Such a condition makes for the likelihood of short circuit.

Mechanically the device consists of a motor with speed-reducing gear, a drive wheel, a connecting rod, a rack and four pinions. Rotation of the drive wheel causes the rack to oscillate in suitable guides. Each of the clamping devices has a pinion attached which engages the rack. Rotation of the drive wheel moves the rack far enough in each direction to cause the pinion and the clamping device to rotate through a full turn. A mechanical counter, the actuating device of which is moved by the rack at its extreme position, serves to show the endurance of each test specimen.

•

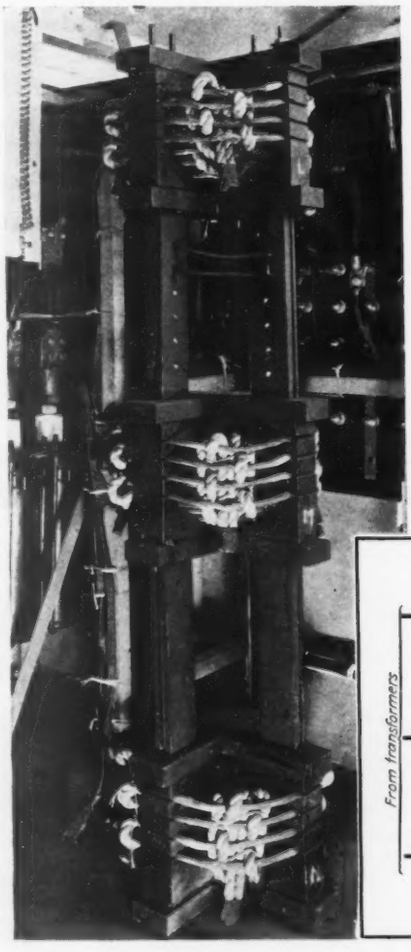
Test Reactor Has Flexible Design

By W. T. ALLEN
Square D Company, Detroit, Mich.

Circuit breaker developments and products of the Square D Company demand an extensive range of energy characteristics in short-circuit testing and the circuit arrangements for these tests must be as flexible as it is possible to make them. Here enters the need for a reactor design that is adequate to withstand the mechanical stresses imposed on it and yet is capable of easy and rapid adjustment to the requirements of different test conditions.

The general scheme of circuit used appears in the accompanying diagram—reactor sections paralleled by shunt resistors of different values. The resistances are easily calculated and fixed for the standardized conditions of recurrent tests, but the reactances are not so amenable to previous calculation. They may be determined approximately by calculation, but the exact positions of the taps on the turns must be fixed by cut-and-try adjustments based on study of oscillograms of short circuits made under the calculated approximations. For this reason as much as possible of the total conductor length in the reactor turns must be available for tapping, thus the turn supports be few and no wider than necessary.

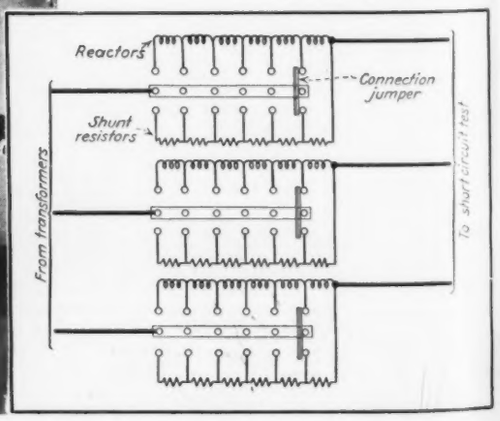
These requirements are nicely embodied in the reactor design illustrated, which is used in the Square D laboratory. The three reactors with wood spacers between are held in compression by four rods with nuts at their tops. The reactor turns are gripped in piles of porcelain blocks, echelon shaped, with grooves to accommodate four turns. The five blocks thus provide for sixteen turns, each one of which is quite easily accessible for tapping along the greater part of its length. The conductor is ordinary bare copper cable. Taps are made with solderless connectors easily movable so their exact positions may be found by the trial-and-error method earlier mentioned. After the tap positions have been fixed hemp rope is interlaced between the conductors in the unsupported sectors to prevent the turns from coming together under short-circuit stresses.



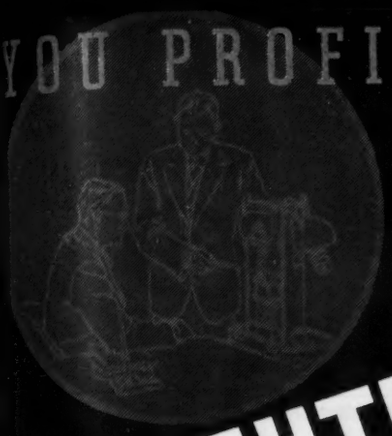
Ultra-flexible reactor design

The rope keeps the reactor turns from coming together under short-circuit stresses.

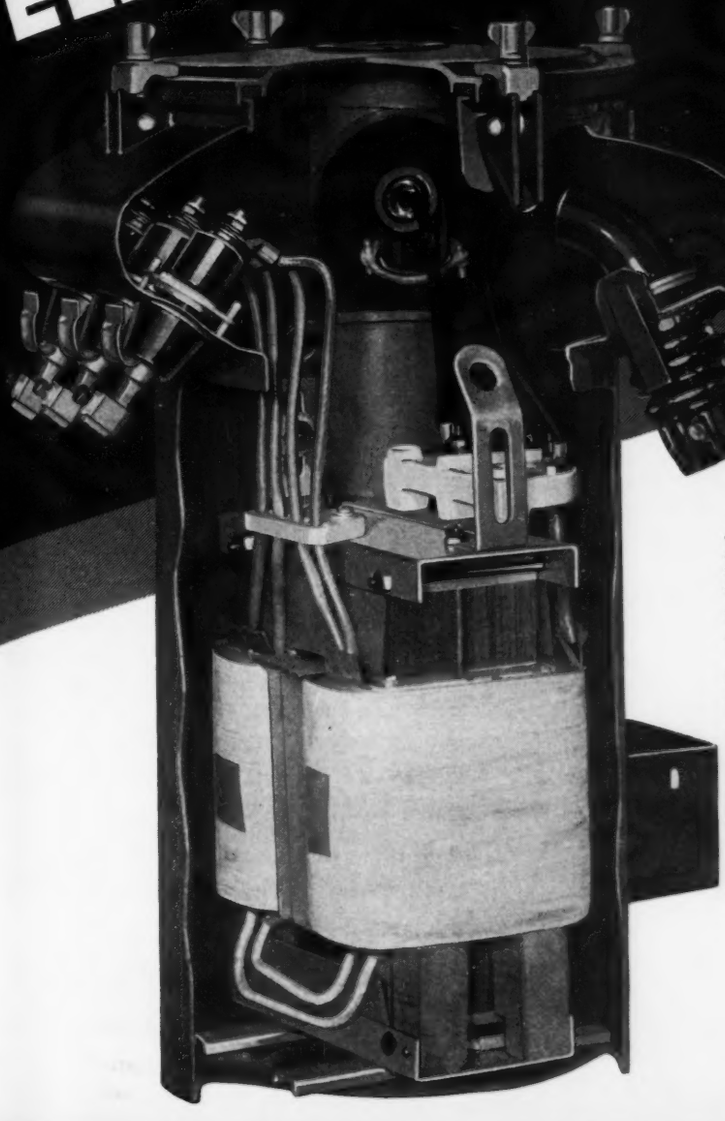
Reactance-resistance circuit for short-circuit tests



YOU PROFIT FROM THIS ADVANTAGE



.. LIGHTNING FLASHOVERS ELIMINATED



Damages from Lightning flashovers — blown covers, punctured windings — are eliminated in L-M Distribution Transformers when used with suitable protective equipment. With generous clearances inside the tank, high impulse strength coils, with high voltage terminals well submerged in oil, and coordinated bushings, L-M Transformers are immune to flashovers.

Get the complete story from your L-M Representative or write Line Material Company, South Milwaukee, Wis.

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L-M DISTRIBUTION TRANSFORMERS

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Utility Relights From Stem to Stern

Faced with the problem of modernizing its old office building, built in 1906, Washington Water Power Company took advantage of the same services available to its customers through the commercial lighting salesman or the illuminating engineer. The results of the job, begun in 1936, are that (1) maximum comfort and good selling conditions are made available to employees and (2) customers have available typical installations of modern lighting practices, according to the entry for this year's Curtis Award.

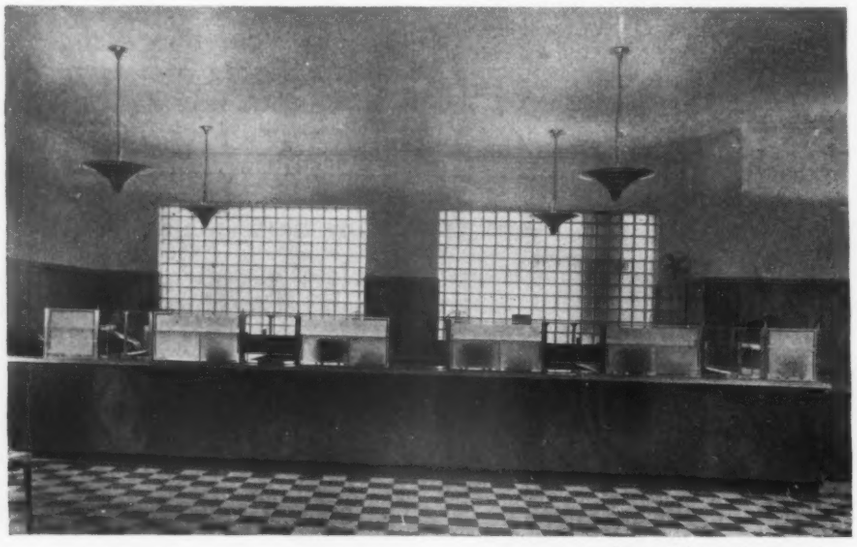
Average lighting levels of 20 to 45 ft.-candles have been secured for all desks in the office building, with a high of 60 ft.-candles in the company's drafting room. Readings of from 40 to 60 ft.-candles are reached in the salesroom. All offices and salesrooms have totally indirect lighting except for certain supplementary lighting. Halls have semi-indirect lighting, service areas are equipped with direct lighting reflectors and washrooms have semi-direct lighting and lumiline wall brackets on each side of each mirror.

In the system operator's offices, auditorium, home service department offices and the mailing department office in the basement trough lighting was used. In these particular cases low ceilings created a problem of high ceiling brightness when conventional pendant fixtures were considered. In each case some space was available above the ceiling for recessing the reflecting trough and very good efficiencies were obtained by careful shaping of the ceiling-reflecting surfaces, which were painted a flat white.

Flat white paint became, in fact, the final answer for all ceilings after tests made upon the most paintable of acoustical materials proved a loss of reflecting area that reduced total reflection factor by about 6 per cent. Very light green is used on all walls except the salesroom, where a pale robin's egg blue is used. Woodwork on the upper floors is light oak, walnut in the salesroom and ivory painted in the basement. All bright metal is furnished in satin chrome.

The main salesroom columns have eight 300-watt inside-frosted lamps in inverted show-window reflectors around each column and for each show case around the column, three 40-watt inside-frosted lumiline lamps in wiring channel. Wall coves over the various display rooms are equipped with 100-watt inside-frosted lamps in inverted show window reflectors on 12-in. centers.

In one of these, a model living room for example, I.E.S. lamps provide primary lighting. Niches are decorated with light using lumiline under flashed opal glass and a pinhole downlight is used over the table and thus the visitor may observe three varying types of lighting.



Courtesy Owens-Illinois Glass Company

Washington Water Power supplements its modern office lighting with glass walls of "Insulux" glass block, which admit well-diffused daylight

•

Baking Goes on Mass Production

Mass production methods for producing pastry shells for cream and frozen pies have been devised by T. J. Matassa, owner of the Crustifier Pie Shop, Los Angeles, working in

30 YEARS OF *Specialization*

Chromel

HEATING ELEMENT *wire*

THE WIRE THAT MADE ELECTRIC HEAT POSSIBLE

In 1906 CHROMEL was discovered, as the first nickel-chromium heating-element. For almost one-third of a century we have specialized on that one product. It is no wonder then, that the electrical industry has full confidence in Chromel.

HOSKINS MANUFACTURING COMPANY • DETROIT • MICHIGAN

Revolving pastry shell baking machines on which individual interchangeable electrically heated baking units are mounted and plugged in

The pastry is cooked during one revolution. The hood reduces radiation and the vent carries off steam and odors. The portable rack is behind the operator.

conjunction with heating engineers of the Los Angeles Bureau of Power and Light. The pastry shells previously were baked in individual electrically heated units having the same appearance as a waffle iron. This method was too slow, so a revolving machine was designed on which the individual bakers could be mounted and plugged in to a circuit.

The machine has a capacity of 60 baking units. Speed is controlled through a variable-drive motor so that the pastry shell is baked to perfection in one revolution.

Interchangeable electrically heated baking units are available for large or medium pie shells or individual patty shells. These units are mounted when not in use on a movable steel rack.

MODERN FACADE AND MODERN LIGHTING

Cambridge (Mass.) Electric Light Company's newly completed office and store in Harvard Square district, featured by latest mode in façade and interior lighting, and providing adequate quarters for appliance displays, kitchen unit exhibits, light and heavier duty home service equipment and customer transactions. Replacing former cramped quarters, which became unsuitable for growing business of this utility in university, residential and mercantile areas.

Small Town Store Uses 150 Ft.-Candles

By T. E. ROCHE
Division Lighting Engineer, Interstate Power Company, Albert Lea, Minn.

Wulff's jewelry store in Albert Lea, Minn., a town of only 10,000 population, has recently installed a lighting job of 150 ft.-candles, which indicates that merchants even in our smaller towns are awake to the values of better lighting in business.

Upon learning that Mr. Wulff was changing locations, we contacted him and it was decided to proceed with a combination down-louvered light

and indirect lighting job. Complete plans were drawn up by the lighting engineer and the job was installed exactly as per plans and specification. The plans called for two 200-watt concentrating mirrored glass reflectors to be set flush in the ceiling to light each of the three 8-ft. showcases.

The indirect component was supplied by four 500-watt mirrored glass units equipped with spill shields set into the top of the wall cases. These units gave an even illumination of 25 ft.-candles throughout the store. The wall cases were lighted with 40-watt case lighting units set on 24-in. centers.

Convenient switching is provided on the down lights in the store so that the clerks can, without leaving the showcase, easily switch on the lights over that case to provide 150 ft.-candles of selling light.

HE UNANIMOUS ANSWER

"Specify Hemingray!"

- ENTIRELY NEW DESIGN
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- BRASS-BUSHED FOR GREATER STRENGTH
- BETTER PERFORMANCE
- TOUGHER GLASS

...AND THE *New* HEMINGRAY SERIES-600 WILL CONFIRM THE DECISION

● You can safely specify the series-600. Hemingray is confident that their use on your primaries will provide lower initial and over-all costs. Their trouble-free performance, even under heavy loading or severe weather conditions, will please you.

You owe it to yourself to get all the facts now—write for samples—learn the proven advantages of Hemingray Glass Insulators. . . . Owens-Illinois Glass Company . . . Hemingray Division, Muncie, Indiana.

3 SIZES

TYPE 660—FOR VOLTAGES UP TO 8,000
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Handle most PRIMARY line requirements

HEMINGRAY INSULATORS

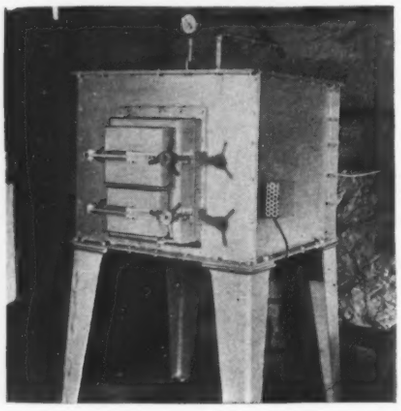
OWENS-ILLINOIS GLASS COMPANY

"First in Glass"

New EQUIPMENT AVAILABLE

Heat-Treating Furnace

Two chambers, one above the other, are supplied in this electric furnace for heat-treating alloy steels, copper, brass, etc. Upper chamber is for treatment of the



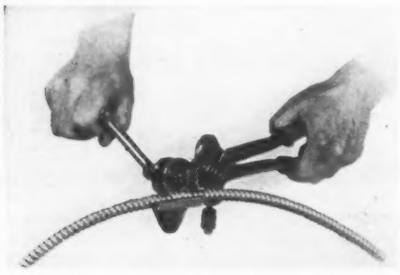
"Carbonair" furnace; for all types of heat treating requiring temperatures up to 2,000 deg. F. **R-S Products Corp.,** Philadelphia, Pa.

work, lower for generation of the protective gases. Carbon deposition is said to be prevented, since gases are generated within furnace chamber and at furnace temperature. Material used for gas generation is supplied in granular form, charged into furnace at intervals in a container and is active only to the demand of the furnace in relation to its free oxygen content. Nickel alloy ribbon is used for heaters. Scaling and decarburization are said to be eliminated.

•

Cable Cutter

To make a smooth cut in armored cable, this cable cutter uses a rotary saw, which makes a diagonal cut, just deep enough to sever one convolution; set by hand, the saw does not touch the insulation. The waste piece of armor is then twisted off and slipped off the conductor and the bushing slipped on over the end of the armor. Cutting shears on top of the unit are for use in snapping off required length of armor from the roll.

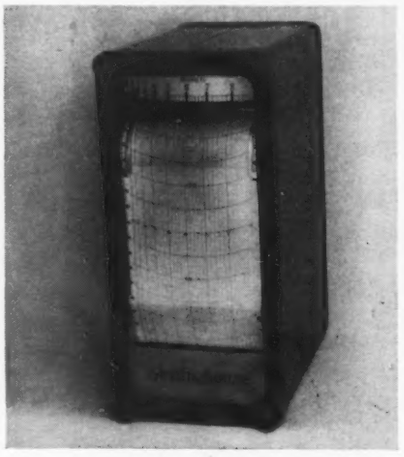


"ABX" safety cable cutter; cuts any type and size of armored electrical cable, Greenfield and metal hose, round or flat. **Ernst W. C. Toepfer,** 2 Broadway, New York, N. Y.

•

Recording Instruments

Measuring elements of this new line of recording instruments are of the direct-acting type and electromagnetic damping is used throughout. D.c. voltmeter, ammeter, millivoltmeter and milliammeter elements operate on the permanent magnet moving coil principle. Single-phase wattmeter, voltmeter and ammeter elements are iron-clad, iron core, single-element dynamometers. In polyphase wattmeter and varmeter elements the double-element dynamometer principle is used. Varmeters are furnished with phase-shifting compensators to provide the necessary quadrature voltages where required.



Type "G-40" switchboard recording a.c. kilovolt meter shown; one of new line of recording instruments. **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

•

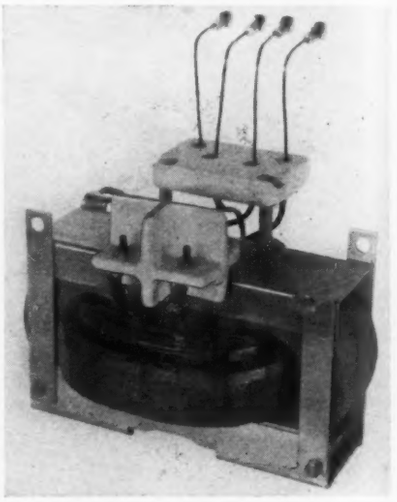
Glass Cloth Anode Bags

Glass cloth anode bags; developed in co-operation with Corning Glass Co. **Hanson - Van Winkle - Munning Co.,** Matawan, N. J.

Glass cloth anode filter bags, in which are placed nickel anodes, are recent developments in electroplating equipment. Purpose of bag is to keep electroplating solution clean, to provide for a smooth nickel plate. Glass cloth is used to resist the destructive action of the high-speed, hot nickel plating solutions which are also high in sulphuric acid content.

Wound-Core Transformer

As its name implies, the important feature of this wound-core distribution transformer is its core construction of two continuous strips of relatively low



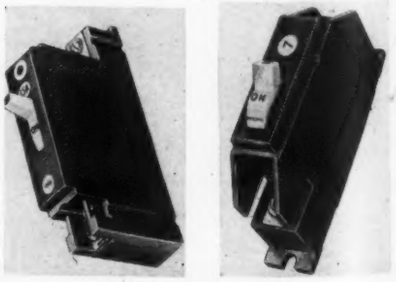
Wound-core distribution transformer; rated 1½ kva., 2,400/1,600Y to 120/240 volts, 60 cycles, high voltage side; units have been produced in 1½, 3 and 5 kva. sizes, 7,620 volts and below. **General Electric Co.,** Schenectady, N. Y.

silicon content cold-rolled steel, tightly wound into two metal rings through and around the coils. Oval in shape, the coils are of short axial length and interleaved in secondary-primary arrangement. Significance of transformer is that it eliminates cutting and placing of hundreds of separate pieces of steel making up core of the conventionally designed transformer.

•

Circuit Breakers

Recent additions to this company's line are two circuit breakers, bimetallic thermal



"Dublbreak" breaker, left; for 125 volts, a.c. or d.c., in capacities from 5 to 50 amp. "FA" breaker, right; for 125 volts a.c., in same capacities. **Frank Adam Electric Co.,** St. Louis, Mo.

types, trip-free and non-closable on short circuits or sustained overloads. One, called "Dublbreak," features double-break contacts with low arcing, quick make-and-break action. It features a red dot signal button which pushes out beyond the face of the unit when circuit is interrupted. At the same time the handle remains at the "on" position. Service is restored by moving handle to "off" and then to "on" position. The other, designed for range and service equipment, lighting and appliance branch circuit panelboards, up to 40 circuits, is of the automatic-trip, automatic-reset type.

•

Ladder Mount

To lend it flexibility, this ladder mount has been designed so it can be rotated throughout a complete circle and rigidly locked in any position on that circle. In addition, it can be elevated to six different

"Keystone" ladder mount, with 24, 26 or 28-in .extension ladder. **Electric Service Supplies Co.,** Philadelphia, Pa.

angles from the vertical and rigidly locked in any of those angles. A complete extension ladder mounted on a rotating device, it is arranged to be carried on any small or large truck body, including a ½-ton "pick-up" type body. An operator standing on the ladder can inspect or service lamps, cables, etc., over a vehicle parked between his truck and the curb.

•

Hand Tachometer

Push-button control is provided on this improved hand tachometer for fixing the hand at indicated speed, if desired, to be read at leisure. Device uses only one scale for three range steps available.

"O-Z" hand tachometer, universal type No. 50, with fixed reading device; total range, 40-50,000 r.p.m., and peripheral speeds of 12-15,000 ft. per minute. **O. Zernickow Co.,** 15 Park Row, New York, N. Y.

THIS LOCKING UNIT

The Bendix-Cory Locking Unit is a key-actuated bolt mechanism designed for use on oil circuit breakers, disconnecting switches or other types of switchgear.

Type B-3003

WILL SAFEGUARD YOUR SWITCHGEAR

Protected from accidental mis-operation, your electrical circuits are positively key-controlled when Bendix-Cory Locking Units are built into the switchgear.

When these units are used in conjunction with blocking segments, rods, plates or other auxiliary adapter mechanism, an effective interlock is created.

While primarily intended for switch manufacturers, the Bendix-Cory Locking Unit also fulfills the requirements of users of Interlock systems who prefer to fabricate a portion of their Interlock equipments. Write for complete information.

BENDIX-CORY

Manufactured By

BENDIX MARINE PRODUCTS DIVISION
OF BENDIX AVIATION CORPORATION
754 LEXINGTON AVE. BROOKLYN, N. Y.

Highway BODIES

—have ample roominess
—offer comfort to the crew
—are convenient in arrangement
—are light weight yet rugged
—are designed for utility service
—are dependable every mile of the way

★ Save money over longest service periods with Highway Trucks—Highway Trucks answer every need because these trucks were designed around utility service needs. Standard equipment includes Highway Winches, Derricks, Tools, Racks, etc. Literature sent on request.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

Atomic-Hydrogen Welding

New atomic-hydrogen arc welding equipment is said to be especially suitable for the welding of special alloys and thin sections difficult or impossible to weld by other methods and to be particularly useful where a fusion weld is required. In this method of welding an a.c. arc is maintained between two adjustable tungsten electrodes and at the same time hydrogen gas is fed to the arc and around the electrodes. Since the work does not enter the electric circuit it does not need to be grounded. A handwheel on top of the welder controls a continuously variable reactor to give "stepless" current adjustments, indicated by an ammeter.

Type "WHB" atomic-hydrogen arc welder; typical of 35-, 75- and 150-amp. sizes (transformer required for separate mounting with 150-amp. size). **General Electric Co.,** Schenectady, N. Y.

•

Visible Disconnect Device

A combined, inclosed disconnect switch and circuit breaker for heavy mill service is a recent development. Window in the front of the case permits operator to see opening of disconnect contacts. Standard blade-type disconnect switch ahead of circuit breaker is manually operated by lever on right-hand side of inclosure. Disconnect and circuit breaker are interlocked so switch cannot be opened or

Visible disconnect switch and circuit breaker device; controls 440 volts, three-phase, 60 cycles, operated from 440 volts, single phase, 60 cycles. **I-T-E Circuit Breaker Co.,** Philadelphia, Pa.

closed while breaker is closed. Circuit breaker itself is electrically operated, remote controlled device of "K" type.

•

Underwater Floodlights

A special thermo-pressure treatment is used to eliminate water seeping into these underwater floodlights, making a watertight unit said to require neither drainage nor ventilation. Suggested for

Type "CF-14" "Aqualux" floodlight with swivel base; uses 500 or 1,000-watt G-40 bulb floodlight lamp; type "CF-16," not shown, uses 1,000- or 1,500-watt lamp; other types of mounting also offered. **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

use in fountains, pools, waterfalls and similar applications, the units should not be operated unless completely submerged, according to the manufacturer. A wide variation of impressive and beautiful lighting effects may be secured through use of different types of control and color lens.

•

Plate, Filament Transformers

High efficiency, low regulation and heavy-duty designs incorporating low temperature rise are said to be embodied in a new line of plate and filament transformers for the electronic field. Line in-

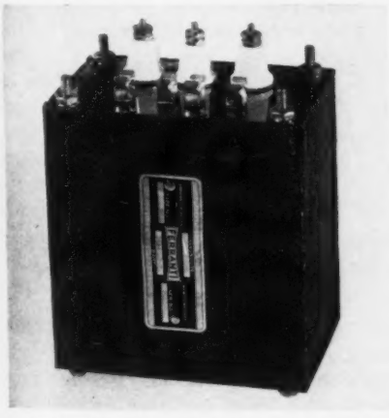


Plate-filament transformer; one of new line, which ranges up to 200 volt-amp. **Ferranti Electric, Inc.,** New York, N. Y.

cludes three separate groups—plate-filament transformers, filament transformers and filter reactors. Last group is said to be unusual in that each reactor is double-wound so that it may be connected either in series or in parallel, providing either of two values of inductance and current in the same unit.

OLIVER

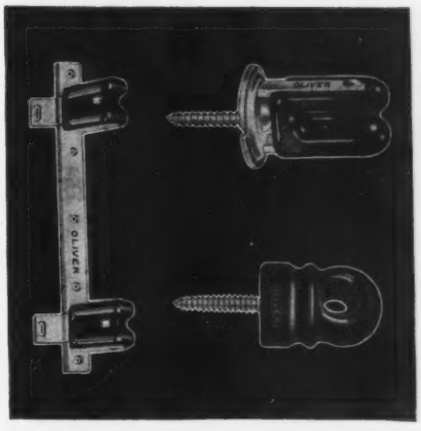
Pole Line Material

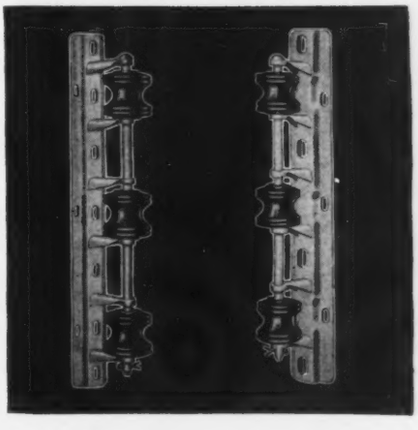
PERFECTED PRODUCTS OF OVER FORTY YEARS OF ENGINEERING AND RESEARCH

SPECIFY OLIVER FOR LONG-LIVED POLE LINE HARDWARE

Throughout the country, thousands of miles of transmission lines equipped with Oliver Materials bear silent testimony to the unusually long life built into all Oliver Pole Line Materials.

Uniformly fashioned from the best quality, new rolled, open hearth steel with the utmost skill and precision and heavily protected with zinc by the Oliver Double Dip Hot Galvanizing Process, Oliver Pole Line Materials just naturally possess a remarkably long life that pays rich dividends on the original investment.





ESTABLISHED 1863

OLIVER IRON AND STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

OLIVER POLE LINE MATERIALS

APPROVED AND ACCEPTED SINCE 1894

OLIVER

News ABOUT PEOPLE

Consolidated Names Rooney General Commercial Manager

Joseph F. Rooney has been appointed general commercial manager of the Consolidated Edison Company of New York, Inc. Mr. Rooney, who has been assistant general commercial manager, succeeds J. H. Aiken, who

was recently made an assistant vice-president of the company.

Mr. Rooney joined Consolidated Edison as an office boy in 1914. After serving in secretarial capacities he was made assistant statistician in 1925, and later became assistant to Vice-President O. H. Fogg, who was in charge of commercial relations for the gas company. In 1936, following the merger of the New York Edison and the Consolidated Gas companies, Mr. Rooney was appointed assistant general commercial manager.

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▶ BENJAMIN S. PHILBRICK has been appointed construction superintendent at Guntersville Dam, according to an announcement made by John B. Blandford, Jr., general manager of the Tennessee Valley Authority. He succeeds George P. Jessup, recently promoted to project manager of the Gilbertville project. Mr. Philbrick has been assistant construction superintendent at Guntersville since 1935, previous to which time he was assistant construction superintendent at Wheeler Dam. Before joining the authority he had 24 years of experience as resident engineer and construction superintendent on hydro-electric, tunnel and transmission line construction.

▶ M. O. ZIGLER is now connected with the Central New York Power Corporation, Syracuse, N. Y. Mr. Zigler was formerly an electrical engineer for the Federal Power Commission in Denver, Colo.

▶ ROGER EVANS has been appointed superintendent of the electric distribution department of the Public Service Electric & Gas Company at Trenton, N. J. He has been associated with Pubic Service since 1923 and has been assistant superintendent, Trenton district, since 1935.

▶ A. A. DYSART of Buctouche, N. B., Premier of the Province of New Brunswick, has appointed himself chairman of the New Brunswick Electric Power Commission, to succeed W. S. Anderson of Newcastle. This is the first time in the history of the commission that a provincial Premier has been chairman.

▶ ARTHUR R. HORNER, assistant superintendent of the electric distribution department of the Public Service Electric & Gas Company at Elizabeth, N. J., has been promoted to the position of superintendent of the company's electric distribution department at Bound Brook.

▶ H. C. GARDETT, formerly design and construction engineer of the Bureau of Power and Light of the City of Los Angeles, has been promoted to the position of assistant chief electrical engineer and assistant general manager. Mr. Gardett became associated with the Los Angeles Bureau in 1912 as an assistant electrical engineer. He was placed in charge of the design and construction department in 1917. He is a native of California and an electrical engineering graduate of the University of California.

Named Secretary N.E.M.A. Refrigeration Group

Bruce A. Fleming has been appointed executive secretary of the refrigeration division of the National Electrical Manufacturers Association, taking the place of Haldeman Finnie,

who resigned to become treasurer of a Detroit advertising agency.

During the last few years Mr. Fleming has been executive secretary of the electric range, electric water heater and the domestic appliance sections of the National Electrical Manufacturers Association.

The refrigeration division's activities were transferred from Detroit to N.E.M.A.'s New York headquarters when Mr. Finnie's resignation became effective on August 1.

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▶ JAMES E. MCCAFFREY, executive head of the California Railroad Commission in Los Angeles, has resigned to become chief engineer and general manager of the Sacramento Municipal Utility District. He succeeds Albert Givan, who is now consulting engineer for the district. Mr. McCaffrey has been a member of the commission's engineering staff for the past eighteen years with the exception of a brief period in 1926 when he was on leave of absence to assist the Federal Power

"If I were an ADVERTISING MANAGER"•

That's just one of the talks to be delivered anonymously by a masked speaker that will set every man thinking at the Annual Conference of National Industrial Advertisers Association in Cleveland, September 21-23. A second masked speaker will tell what he would do if he were a publication representative.

We're not going to tell you much here—just highlight the program enough to make your mouth water and your brain tingle.

T. M. Girdler, Chairman, Republic Steel Corporation, is scheduled for the opening address and when "T. M." talks he says something.

J. H. McGraw, Jr. will talk on "What I Would Do *Now* If I Were An Industrial Advertising Manager."

The new Publisher's Statement will receive full discussion.

Clinic sessions, so popular last year, will again cover a wide range of interesting subjects. Two half-day sessions instead of one.

A general conference session will cover such subjects as "Preparing the Plan", "How to Gather Usable Material", "Copy Technique", "How to Sell Management", "Co-ordinating Sales and Advertising" and "How and Why to Use an Industrial Agency."

Another session will deal with "Problems of the Small Advertiser", "Production Problems", "Public Relations"—and there are many others.

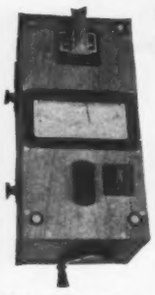
If I were an Advertising Manager, I certainly would start now to make plans to attend the 16th N. I. A. A. Conference even if I had to hitch-hike to Cleveland. And I would send in my advance registration now to—Ed. Bossart, Bailey Meter Company, Ivanhoe Road, Cleveland, Ohio.

IF I EMPLOYED AN ADVERTISING MANAGER—I would make certain that he attended this Conference, because changing times and markets demand a changed viewpoint—a new viewpoint that can be obtained only by hearing discussions by men whose experience is up-to-the-minute—right up to September 21st.

NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION

100 EAST OHIO STREET • CHICAGO, ILLINOIS

"MEGGER"

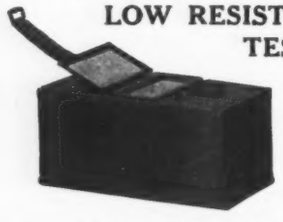


CAPACITANCE METER

A portable direct-reading, multi-range microfarad or capacity meter with self-contained hand generator, and having the outstanding advantage of automatic compensation for parallel resistance leakage down to 10,000 ohms. Ranges up to 10 microfarads. Has valuable applications for locating open-circuit faults on cable, for periodic capacitance measurements on cable and large machines and for miscellaneous use.

Write for Bulletin 1405-W.

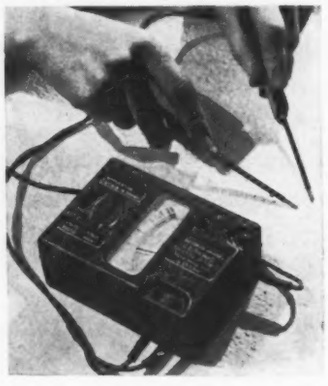
"DUCTER"
LOW RESISTANCE TESTING SET



A portable direct-reading instrument for quick measurements of resistance—from as low as .000001 ohm up to 5.00 ohms. Operates from a battery, the voltage of which does not have to be exact. Has valuable applications for testing bus-bar connections, for measuring switch, circuit breaker and relay contact resistances; for bar-to-bar tests on commutators, and for measuring resistances of field coils, transformer windings, etc.

Write for Bulletin 1440-W.

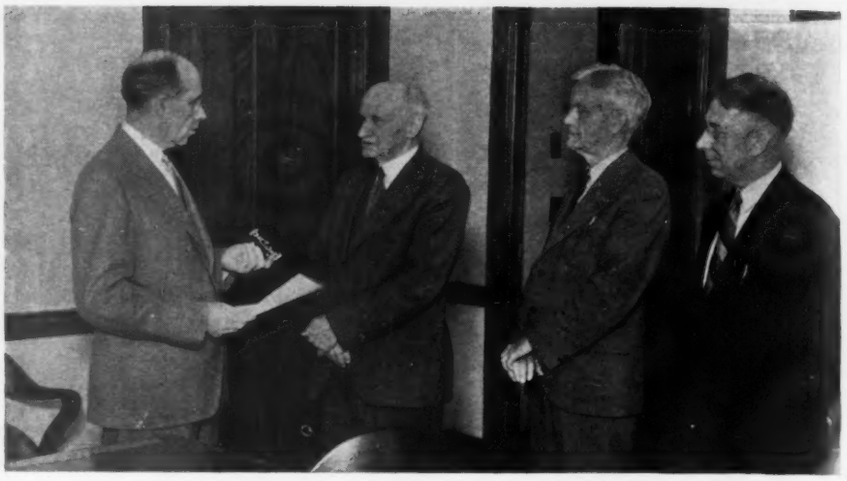
MIDGET "MEGGER"
Circuit Testing Ohmmeter



Small. Portable. Requires no adjustment for battery voltage. Ranges from .1 ohm up to 200,000 ohms. Ideal for test men and repair shops.

Write for Bulletin 1495-W.

JAMES G. BIDDLE CO.
ELECTRICAL INSTRUMENTS
1211-13 ARCH STREET PHILADELPHIA, PA.



HONOR SWITCH PIONEER—Nelson J. Darling, manager of General Electric's works at Lynn, Mass., presenting engraved mercury switch to C. M. Green, retired engineer, a pioneer in development of mercury switches. Watching the presentation are G. N. Chamberlain and J. I. Hull of the engineering staff at the Lynn works. Mr. Green was formerly an engineer with the old Brush Electric Company

Commission in a survey of the Central Valley project. He has been head of the commission's Los Angeles office since 1935. For three years prior to that he was gas and electric engineer.

► J. G. HAWKINS, formerly assistant treasurer and assistant secretary of the Pacific Power & Light Company, Portland, Ore., has been elected treasurer to succeed the late M. J. Wilkinson. Mr. Hawkins has been connected with the utility industry since 1905, when he joined the accounting department of one of the predecessors of the present Portland General Electric Company. In 1909 he became associated with the Astoria Electric Company, Astoria, Ore., one of the predecessors of Pacific Power & Light.

► JOHN A. BECKER, director of the REA in Wisconsin for more than two years, has been named assistant general manager of the Wisconsin Development Authority by its directors.

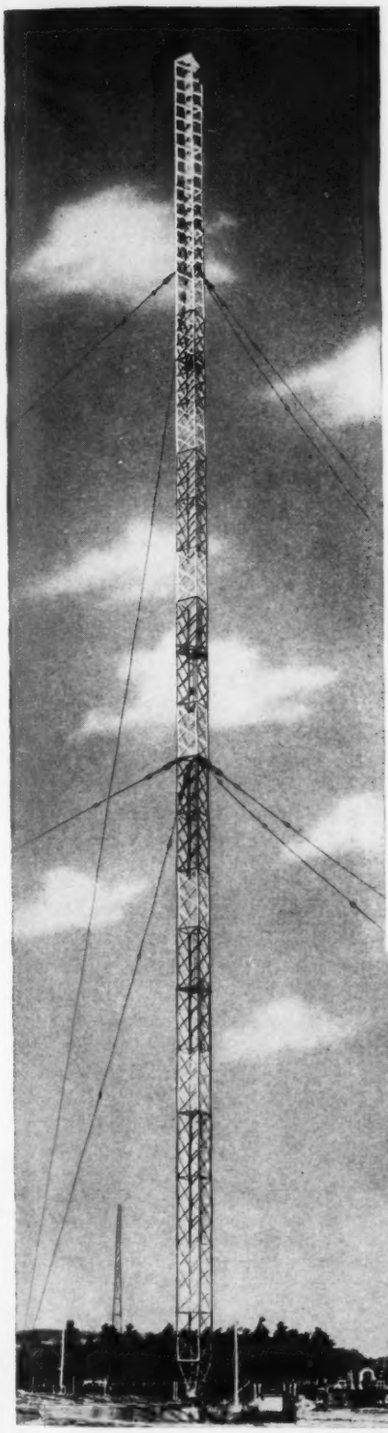
► EDWARD W. GORRY, superintendent, a.c. substations bureau, Consolidated Edison Company of New York, Inc., and one of the early supporters of the industrial safety movement, retired August 1, after 48 years of service. Mr. Gorry is known in utility circles as an effective writer and speaker on the subject of accident prevention. He has been chairman of the Insull Medal award subcommittee for accident prevention, a member of the executive committee of the Metropolitan section of the National Electric Light Association and a member of the central safety committee of the Consolidated Edison Company. He has served on committees of the American Institute of Electrical Engineers, American Society of Safety Engineers and the Edison Electric Institute. At the age of 17, in 1890, Mr. Gorry was first employed by the United Electric Light & Power Company, a predecessor of Consolidated Edison Company, as an armature winder and repairman. Promotions to many operating positions followed and he was finally appointed superintendent of substations.

► CHARLES COLE, district manager for the Missouri Public Service Corporation, Warrensburg, Mo., has been transferred to Lees Summit, where he will be manager of District C for the company.

► COL. R. E. B. CROMPTON, dean of the British electrical industry, at the patriarchal age of 93 has witnessed the celebration of the diamond jubilee of R. E. Crompton & Company, the firm which he founded in 1878 to introduce electric lighting in the United Kingdom. Colonel Crompton still retains his seat on the board of Crompton, Parkinson & Company, Ltd., the electrical engineering organization, which includes Colonel Crompton's company among its founder companies. Colonel Crompton has served twice as president of the Institution of Electrical Engineers and is a holder of the Faraday Medal.

► F. H. TRAVERS has been appointed electrical engineer in the State Department of Public Works, Hartford, Conn. Mr. Travers formerly was employed in the wiring device engineering department of the General Electric Company, Bridgeport, Conn.

► L. M. VILES, president of the Buda Company, Harvey, Ill., for more than 20 years, was recently elected to the position of chairman of the board. J. S. DEMPESY, who has been associated with the company for many years as secretary, treasurer and vice-presi-



One of the World's *Highest* "Far Speaking Towers"

TOWERING 625 feet, Station WGY's new vertical antenna at South Schenectady, N.Y., enters the list of most recent achievements in tower construction.

This huge cage of structural steel —9 feet square in cross-section and guyed in four directions from two levels—superimposes a vertical load of 475,000 pounds on the tapered porcelain insulator which is its base.

It was designed by American Bridge Company in accordance with specifications approved by the Aviation Division of the Dept. of Commerce. Its construction required some 102 tons of fabricated steel, guy cables and fittings. The entire structure, inclusive of concrete foundations, anchorages and the installation of porcelain base, guy cable insulators, beacon and obstruction lights and miscellaneous materials supplied by others, was erected by American Bridge.

Whatever your specialized tower requirements, whether for radio or electric transmission, you'll find American Bridge fabricating and erecting facilities and technically trained personnel more than equal to the demand.

THE VERTICAL ANTENNA is guyed with American Steel & Wire Company's galvanized steel cables at the 250 and 500-foot elevations. Each cable is strung with insulators and at ground level stretches out 425 feet. High and low-level cables from each corner are paired to a common concrete anchorage. Antenna is painted in alternate orange and white bands. The old antenna supporting towers may be seen in right background.

THE BOTTOM of the steel tower terminates in a point to rest on the porcelain insulator, which was wood-sheathed during erection for protection.

THE TAPERED PORCELAIN insulator at the tower base varies in diameter from 20 inches to 3 feet. It is 4 feet high.

• • •

W. J. Purcell, Chief Engr., Station WGY.

AMERICAN BRIDGE COMPANY

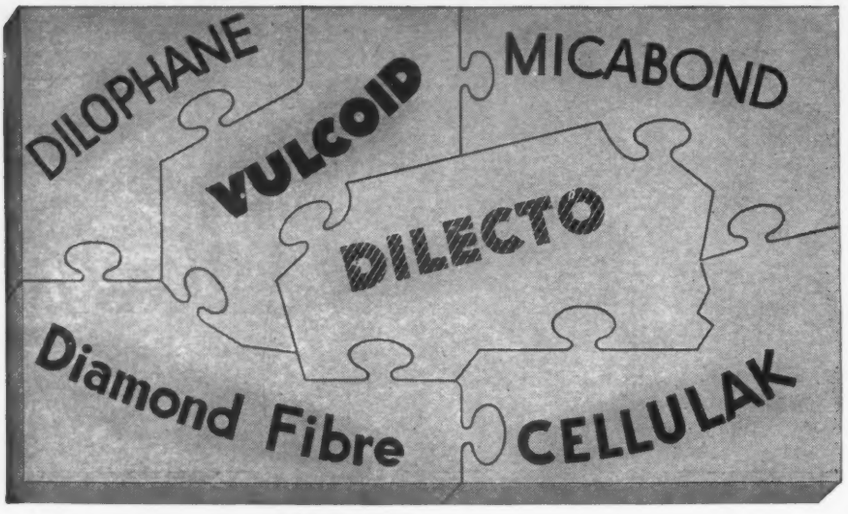
General Offices, Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* • United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

INSULATION HEADQUARTERS



PUZZLED?

There's no need to be . . .

Each one of these Continental-Diamond products fits perfectly into the Insulation Picture. Each has physical and dielectric properties which make it *exactly* right for specific insulation requirements. And it's the job of Continental-Diamond Engineers to discover which product or formula is best adapted to the service demanded. If you use laminated insulation in any form we would like to determine (at our own expense) whether we can offer you a material that will improve your product or reduce manufacturing costs or both. We are doing that right along . . . A letter with brief specifications will make it our move.

CONTINENTAL-DIAMOND FIBRE CO.

Newark, Delaware

Represented in Canada by DIAMOND STATE FIBRE CO. OF CANADA, LTD., TORONTO

DILECTO

A laminated plastic, commonly known as phenol fibre, made in sheets, rods and tubes or fabricated parts to specifications. Has high electrical insulation properties, great resistance to water, practically unaffected by oil or mild acids. It is a strong, tough material with a wide application for use in connection with modern electrical appliances.

DIAMOND VULCANIZED FIBRE

A tough, economical, insulating material made in standard sheets, rods and tubes. Can be readily fabricated or formed. A material of countless applications.

VULCOID

A thermo-plastic, non-hygroscopic insulating material made in standard sheets, rods and tubes. It is strong and tough, has good electrical insulating properties and is readily fabricated.

MICABOND

Thin splittings of mica bonded together with specially developed binders into standard plates, tubing or in formed rings, punched and sawed segments or other special parts. Micabond has high dielectric strength, is practically unaffected by acids, has high heat and moisture resistance, is readily punched, sawed or formed.

CELLULAK

A laminated form of insulating tubing, possessing extremely high dielectric properties, and marked resistance to flash-over.

DILOPHANE

A translucent, laminated plastic in colors. It provides perfect light diffusion, is not inflammable, and is manufactured in practically any color imaginable with either a glossy or dull finish.

dent, was elected president to succeed Mr. Viles. F. E. PLACE, who has been connected with the company since 1908, retired as senior vice-president. An executive committee, consisting of Mr. Dempesy and two operating vice-presidents, R. K. Mangan and E. D. Conant, will direct the affairs of the company.

OBITUARY

A. D. Mackie

Arthur D. Mackie, vice-president of the Central Illinois Light Company, Springfield, Ill., died July 19 at Winnetka, Ill., in his sixty-third year. Mr. Mackie was well known in the public utility industry not only in Illinois but throughout the Middle West.

He had been associated with the Commonwealth & Southern Corporation, of which Central Illinois Light is a subsidiary, since 1888. He started as an office boy and messenger and worked up through the ranks of the company to the vice-presidency in 1914. This position he held until his death. He served as president of the Illinois Public Utilities Association.

Because of the heated fight for many years over municipal ownership in Springfield, Mr. Mackie was drawn into national prominence and among utilities operators was regarded as one of the best in the country.

Commissioner Willis J. Spaulding, who during the long controversy over municipal ownership was on the opposite side from Mr. Mackie, paid this tribute to him:

> Mr. Mackie was a most loyal and courageous supporter of the utility organization which he represented so long in this city. Naturally, it was his duty to oppose the public ownership program which was the chief political issue in Springfield beginning in 1915 and continuing for more than twenty years. He was a fearless and capable fighter for the interests of his company and enjoyed the admiration and affection both of his employees and of his employers, and a large section of the people in general. This in itself is the strongest testimonial of his worth as a man and citizen.

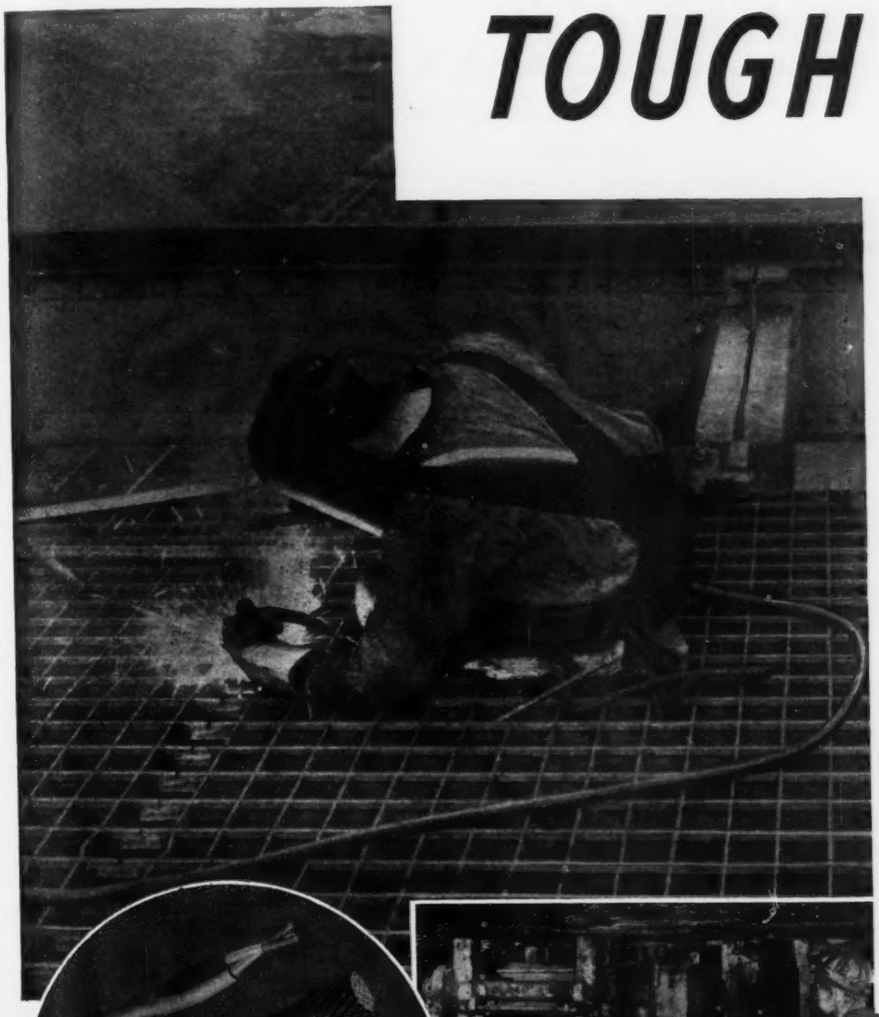
•

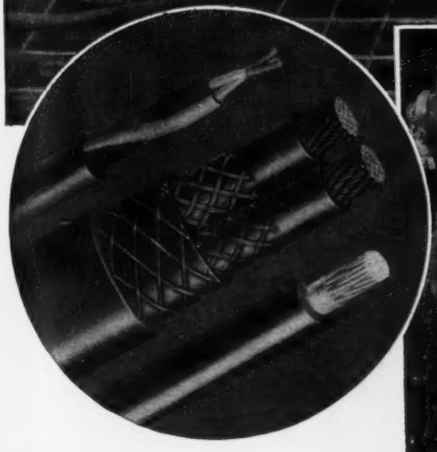
► WALTER F. SANDERS, manager of the Plymouth (Wis.) Electric and Water Utilities, died July 21 in a Madison, Wis., hospital in his forty-sixth year. Mr. Sanders had served as manager for ten years. He was president of the Wisconsin Municipal Utilities Association in 1935.

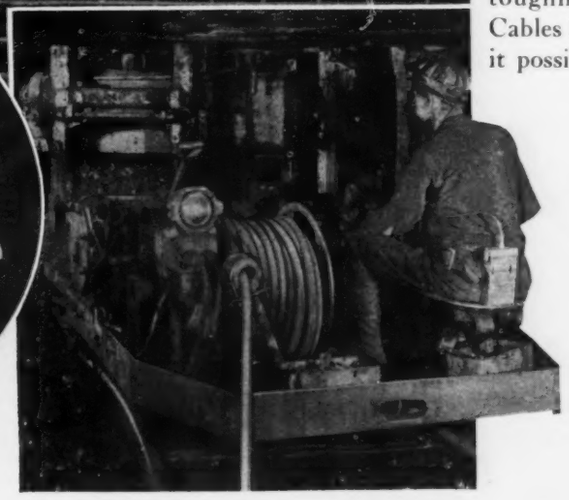
► E. J. LENZ, manager of the north division of the Mississippi Power & Light Company, with headquarters at Greenville, died at his home in that city July 22, following an illness of three weeks.

TOUGH *they have to be . . . and*

TOUGH *they are!*







IF YOU use electrical Cords and Cables you will find it worth your while to investigate Amerclad All-Rubber Cords and Cables. For whatever your requirements may be you will find that they are within the Amerclad range. You will find, too, that Amerclad All-Rubber Cords and Cables will always meet your electrical needs with complete satisfaction and economy.

Amerclad construction consists of one or more conductors encased in a protective sheath of tough, resilient rubber. It is this tough protective covering that gives added life to Amerclad Cords and Cables. It resists rough treatment, oil, water, and abrasive wear . . . it withstands the rigors of heavy duty which are particularly destructive to portable cords and cables. Yet, with their extra toughness, Amerclad Cords and Cables have the flexibility that makes it possible to move them from place to place with ease.

Amerclad All-Rubber Cords and Cables are made by the American Steel & Wire Company, manufacturers of a complete line of Electrical Wires and Cables. When you order "Amerclad" you get the quality that is based on more than a century of wire-making experience. Send for our catalogue.

AMERCLAD *All-Rubber* CORDS AND CABLES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Manufacturing AND MARKETS

Washer Shipments Off From Year Ago

Shipments of household washers in the first six months this year totaled 541,898, as against 949,328 in the same 1937 period, as reported by J. R. Bohnen, executive secretary of the American Washer and Ironer Manufacturers' Association. June shipments were 78,354, against 84,016 in May and 143,073 in June, 1937.

Household ironer shipments totaled 51,349 in the first six months, against 94,696 in the 1937 period. Shipments in June totaled 7,046, against 6,675 in May and 14,755 in June, 1937.

Washers retailing at $70 and more were 37.5 per cent of all those shipped in the first six months, against 40.5 per cent last year. The average retail price was $102.84, against $96.30. The trend has been toward purchase of washers in the upper price levels.

•

Electrical Goods Orders Show Second Quarter Gain

New orders booked for electrical goods during the second quarter, as reported by 78 manufacturers, amounted to $157,315,411, as compared with $154,153,559 in the first quarter and $260,835,867 in the second quarter last year, according to the Department of Commerce.

For the first six months such orders totaled $311,468,970, compared with $531,900,162 in the corresponding period last year. Data for electrical motors, storage batteries, domestic appliances, industrial equipment and other electrical apparatus and supplies are included in this classification.

•

Oil Burner Shipments Gain

Domestic shipments of oil burners during June amounted to 9,148, as against 8,177 in May and 14,081 in June last year, according to the Department of Commerce. For the first six months domestic shipments totaled 43,149, against 74,560 in the corresponding period last year.

•

Manufacturers Issue Earnings Reports

The following reports of earnings have recently been issued by electrical manufacturing companies:

ANACONDA WIRE & CABLE—Including subsidiaries (preliminary report), second quarter: Net loss, $172,343, compared to profit of $834,042, or $1.98 a share, in 1937 period; profit on manufacturing operations, $544,763, against $1,809,586; total income, $550,440, against $1,812,274; expenses, $508,693, compared to $560,272; retirement reserves $214,090, against $251,131. There were no federal income taxes, against $166,829 in the 1937 period.

BLAW-KNOX, including subsidiaries—Six months to June 30: Net profit, $48,888, equal to 4 cents each on 1,334,458 shares, compared with $1,295,513 or 97 cents a share on 1,332,558 shares last year. Gross sales, less returns and allowances, were $5,702,905, against $8,510,608.

ELECTRIC CONTROLLER & MANUFACTURING—Six months ended June 30: Net profit $86,523, equal to $1.22 each on 70,855 capital shares, compared with net profit of $466,931, or $6.59 a share, for first half of 1937.

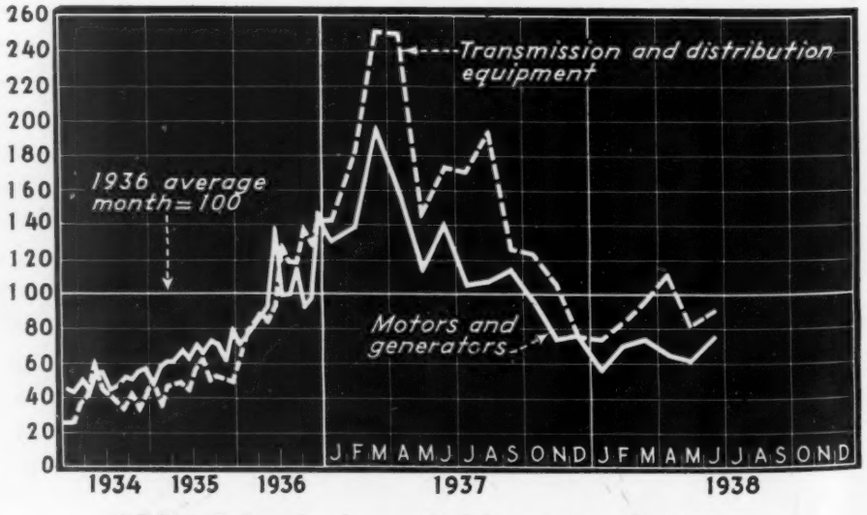
N.E.M.A. Reports Rise in Orders

Orders received for electrical goods in the "Motors and Generators" group moved up sharply in June, according to index numbers announced by the National Electrical Manufacturers Association. The index rose from 62.5 in May to 76.0, an increase of 13.5 points, equivalent to 21.6 per cent. Percentage changes for previous Junes over May during the preceding four years were successively +1.3, —4.9, +45.9, +23.8. The new index is the highest for any month thus far in 1938.

Orders for transmission and distribution equipment also increased. The June index is 89.3, compared with 81.6 for May, a rise of 7.7 points, or 9.4 per cent. Changes for June over May in previous years were successively —26.8, —7.9, +10.5 and +17.4 per cent.

The classifications were defined in the ELECTRICAL WORLD of July 16, page 82.

	Motors and Generators		Transmission and Distribution	
Month	1937	1938	1937	1938
April	158.9	66.6	250.1	111.1
May	113.4	62.5	147.2	81.6
June	140.4	76.0	172.8	89.3



N.E.M.A. Index of orders received for motors and generators—for transmission and distribution equipment

Electrical Exports Drop in First Half

Exports of electrical machinery and apparatus during the first half of the year amounted to $51,727,000, as compared with $55,117,000 during the corresponding period last year, according to the Department of Commerce. For June these exports totaled $8,343,000, against $8,552,000 in May and $9,146,000 in June last year.

Exports of household refrigerators in the first six months totaled 75,899 units valued at $5,605,000, compared with 101,943, valued at $7,444,000, in the same period last year. In June these exports were 9,305, valued at $722,000, against 13,001, valued at $935,000, in May and 18,721, valued at $1,319,000, in June last year.

In contrast with the electrical foreign trade, exports of finished manufactures, which include electrical apparatus and refrigerators, were slightly higher in the first six months this year than in the corresponding period of 1937, totaling $800,145,000, against $777,323,000.

•

New Research Organization

The Canadian Research Institute, 709 Spadina Avenue, Toronto, Canada, has been organized to assist industrial companies in the development of new and improved products and specializes in the design and fabrication of laboratory and industrial equipment for manufacturing and testing purposes. R. S. Soanes is director of research; the staff is said to be especially skilled in the construction of electronic devices.

•

Lets Transformer Contract

TVA has awarded a contract to the Westinghouse Electric & Manufacturing Company for large power transformer and neutral grounding reactor, with accessory apparatus, for Guntersville hydro-electric generating plant at a price of $68,370. An award for oil purifiers for Guntersville and Chickamauga power plants has been placed with the DeLaval Separator Company, New York, at $10,424.

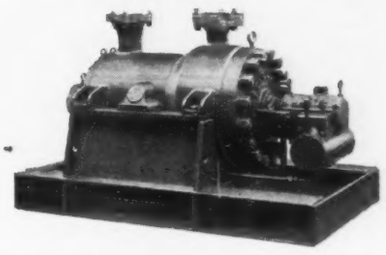
New York Metal Prices

	Aug. 3, 1938 Cents per Pound	Aug. 9, 1938 Cents per Pound
Copper electrolytic	10.125*	10.125*
Lead Am. S. & R. price	4.90	4.90
Antimony	10.75	10.75
Nickel ingot	35.00	35.00
Zinc spot	5.15	5.15
Tin straits	43.75	43.50
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

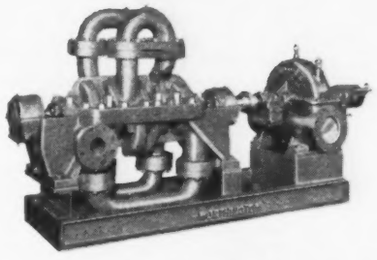
FOR ANY BOILER FEED CONDITION

...Without Compromise



Pressures in lb. per sq. in.

← 3000 • 1300



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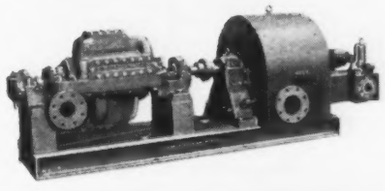

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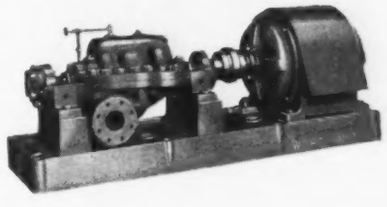

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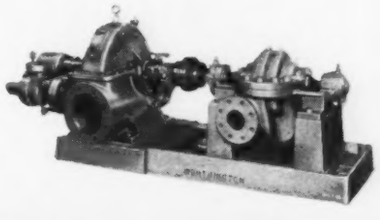

← 350

FOR the vital power plant function of boiler feeding, there need be no compromise in selection. A complete line, plus the competent advice of Worthington's widely experienced engineers, assures the correct selection ... without bias ... for safe, uninterrupted service at low initial cost, and at lowest cost for normal maintenance.

• *Literature on request*

WORTHINGTON PUMP AND MACHINERY CORPORATION
General Offices: HARRISON, NEW JERSEY
Branch Offices and Representatives in Principal Cities throughout the World

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Reliable

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Install Service Cable more conveniently.

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Save a length of cable on each installation.

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Reliable Concentric Cable Clamps are high in strength, neat and non-corrosive. They do not injure the cable and they are reasonably priced.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE • CHICAGO, ILLINOIS

Field Reports on Business

Electrical equipment purchases are tending upward, with orders held in abeyance now going on the active list. New construction on the Pacific Coast is aiding business. Appliance sales are active in New England. Improvement is noted in the Middle West.

NEW ENGLAND

Intense heat and humidity last week stimulated air-conditioning sales most encouragingly. Carrier representatives (Boston Filter Company) sold about 60 room coolers of ¾ hp. each for office building, residential and other use, one order covering 27 units for a single office suite. York Ice Machinery announces a recent contract for a 100-ton installation to serve twelve operating suites at the George Robert White House under construction for the Massachusetts General Hospital. The new Trans-Lux theater at Boston will have a 70-ton air-conditioning unit. In Boston Edison territory twelve contracts totaling 142 hp. were sold in July, a gain of 50 per cent in the number of jobs and 20 per cent in connected horsepower over last year.

Range, refrigerator and appliance sales in general are reviving. Fan stocks were greatly depleted by the recent heat. Commercial cooking sales include a 55-kw. bakeoven for a Gardner, Mass., hospital. The Grafton, Mass., state hospital will install a complete electric kitchen rated at about 125 kw., and a Westerly, R. I., grill has purchased a 60-kw. installation. An Andover, Mass., roadside stand has bought new kitchen equipment of about 35 kw. rating. To provide better display of household appliances than was feasible in the older quarters of the organization in the wholesale district downtown the Wetmore-Savage-Westinghouse establishment has opened a large exhibition room on the ground floor of the New England Power Building in the Back Bay of Boston.

Store lighting continues active, as does office building illumination. Institutional building construction aggregating about $3,500,000 will require substantial purchases of electrical wiring, illumination and power material. Power plant equipment for the Winchester Repeating Arms Company, New Haven, Conn., Arthur L. Nelson Engineers, Boston, lately purchased and now scheduled for preliminary operation, includes two 5,000-kva. General Electric turbo-generators and two Riley Stoker Company boilers.

PACIFIC COAST

Counting upon the converging peaks of such factors as power company, railroad and FHA home building, August has been awaited as the month definitely marking the return of better business. This confidence is apparently justified. Considerable carload buying of pole line hardware and accessories by utilities is reported, largely for central stocks to cover accumulated routing maintenance and minor extensions.

Railroad business is featured by electrification of San Francisco Bay Bridge suburban service and wiring of $7,000,000 Los Angeles Union Depot, but their miscellaneous electrical purchasing is lower than hoped because of nominal rate increases where 15 per cent was needed. An intercoastal steamer freight rate advance of 10 per cent on heavier items is reflected in higher coast prices on conduit and roughing-in material. FHA homes are rolling up an excellent volume in cheaper fixtures and wiring devices, intensified in Bay area by campaign for "exposition year rehabilitation."

Contracts totaling $140,000 have been placed for transmission line equipment at Kendricks project in Wyoming and $35,000 for El Centro switchboard installation in Imperial Valley, Calif., which is also requesting bids for 100 miles of 4,160-volt and 13 miles of 33-kv. distribution lines, including transformers.

NEW YORK

New orders for heavy electrical equipment are beginning to trickle into the market again. Many orders canceled when business began to sag over a year ago are being put on the active list. This condition has been brought about as a result of the rising trend in power output and new sales resulting from aggressive promotion drives.

Although the spending-lending procedure has bogged down during the absence of President Roosevelt from Washington, things are expected to take on new activity upon his return. Pouring of public money should act as a trade stimulant as fall approaches.

Utilities are hopeful of better times over the next few months, but set little chance of large-scale building until the punitive attitude of the government is changed and new capital funds obtained to finance construction. Summer-end appliance campaigns continue to hold the major attention of the utilities as the need for revenue becomes more urgent.

CHICAGO

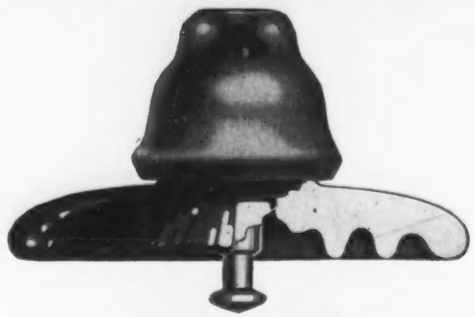
Electrical business for the first month of the third quarter showed moderate improvement over the first six months. Small gains were made pretty general throughout the entire industry except in the manufacture of heavy apparatus. Industrial activity and utility buying have shown small tendency toward any marked improvement as yet. However, inquiry among the larger industrial plants reveals a reduction of nearly 30 per cent in inventories since the first of the year. With a steadily increasing demand in evidence, a spurt in buying should not be far off.

Despite a week of hot weather, fan business proved to be disappointing. Although retail sales were fair, the demand was not enough to move wholesalers' stocks. Roaster sales have been good, but averaged 15 per cent below last year. Demand for ranges and water heaters is steady, while stoker installations show a sharp increase. Contractors report a large number of signs and additional outlets installed during July.

With $1,000,000 already spent for air conditioning, the Merchandise Mart has authorized $3,000,000 for additional equipment. Electrical work on six PWA school contracts awarded last week amounted to $124,000. International Harvester Company reopened three of its Chicago plants after a two-week shutdown. Five other plants in this area also resumed operations.

Thomas *Suspension-Strain* Insulators

Thomas No. 1243-A
10' Corrugated "Standard" Design
5¾" Spacing



Thomas No. 1267
10' Corrugated "Heavy Disc" Design
5¾" Spacing

Thomas No. 1257
10' Plain "Heavy Disc" Design
5¾" Spacing

In the 15,000 lb. strength rating class, Thomas offers a complete line of the above varied designs in both Ball & Socket and Clevis connections.

While the "Standard" types offer more leakage surface and are more commonly used for normal operating conditions the "Heavy Disc" types are exceptionally resistant to malicious breakage and heavy power arcovers and are recommended for conditions requiring greater ruggedness and porcelain massiveness. All three types are well balanced and combine correct design with ruggedness without appreciably sacrificing desirable leakage, thermal, and flashover characteristics.

OUR 65TH YEAR
UNDER ONE NAME "THOMAS"

For Long Life and Unexcelled Performance Thomas Suspension-Strain Insulators installed today will prove more economical in the long run.

WRITE FOR COMPLETE ENGINEERING DATA AND DESIGN DETAILS.

GRAYBAR ELECTRIC COMPANY, INC., AGENTS

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Municipal Plants

LEBANON, IND.—Public Service Company of Indiana has asked the U. S. Supreme Court to determine whether a municipality can use the power of eminent domain to acquire a going public utility business. The case arises from the attempt of this city to condemn the utility's property used and useful in supplying customers in the city and the adjacent area. Attorneys for the utility declared that a careful search had found no other case in the United States where a Court of Appeals has approved the use of a general eminent domain statute "as a vehicle for the acquisition by any one of a going public utility business without the consent to such procedure by the public utility company involved." The Indiana Supreme Court upheld the right of the city to condemn the utility business and ordered the appointment of appraisers to assess damages payable to the utility. The utility has asked the U. S. Supreme Court to take jurisdiction in the case on appeal.

LECOMPTON, KAN.—By a vote of 136 for and only 3 against the proposal, citizens on July 26 took themselves out of the electric utility business. The town has a population of 293. The citizens voted to sell the municipal distribution system and to grant a twenty-year franchise to the Kansas Electric Power Company. The company had been selling at wholesale to the town.

KENNETT, MO.—Hearing on temporary injunction restraining the city from proceeding with plans to let contract for construction of a municipal light plant and distribution system will be held before Federal Judge George H. Moore in St. Louis, Mo., early in September. The injunction came after the way was cleared through refinancing of bonds nearly a year ago. Request for the injunction was made by the Arkansas-Missouri Power Company, which serves Kennett and vicinity, the application contending that the Mayor and City Council delegated discretionary authority in the letting of the contract for the construction of the plant and that the contract violated the minimum wage law of Missouri.

ST. CHARLES, MO.—A motion by the city to set aside a temporary injunction preventing payment of $40,000 for three generating units which would enable the city to produce its own electricity for the municipal water works has been sustained by Circuit Judge Edgar B. Woolfolk. Judge Woolfolk held the purchase contract with Fairbanks, Morse & Company was legal under a resolution of the Board of Public Service authorizing it. Petitioners in the injunction suit contended the contract was without authority of ordinance. The injunction suit will be heard on its merits at a time not yet fixed. The city has been obtaining energy from the Union Electric Company. The court's order permits installation of the generating units.

WAPAKONETA, OHIO—A. A. Klipfel, Jr., City solicitor, has sued in the State Supreme Court for an order to compel other city officials to proceed with construction of a proposed $186,000 electric power plant. His petition contended that all plans were prepared for building the municipal plant with a federal grant of $80,000, when the proposal was abandoned by the mayor and council, which made a new power contract with a private company.

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GREENLEE
HYDRAULIC CONDUIT
AND PIPE BENDER
SAVES MONEY

It bends conduit quickly.
It is easy to use.
It makes smooth bends.
It saves the cost of manufactured bends.
It makes wire and cable pulling easy.
It is easy to take to the job.

The Greenlee Hydraulic Conduit and Pipe Bender is as easy to use as the picture above shows. It is made in two sizes for conduit from 1¼" to 3" and from 3" to 4½". The small bender can be fitted with a set of attachments for bending thin-wall steel conduit in 1¼", 1½" and 2" sizes.

Investigate now and see how you can use this valuable tool to cut your costs. Tell us what you want to bend, and complete details will be sent.

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

LEADING power companies have found that Goulds Hydroil Purifiers protect and help maintain electrical service.

They realize that periodic centrifuging keeps insulating oils at the high dielectric strength necessary for safe, efficient operation of high tension equipment.

Goulds Hydroil Purifiers by centrifugal action, remove water, sludge, carbon and other contaminating materials from oils used in transformers, circuit breakers and switches at low cost. They reduce the hazards of short circuits and dangers of costly interruptions.
Goulds Hydroil Insulating Oil Purifiers are designed for permanent installation or portable use. Sizes are available to meet every requirement. Write today for Bulletin No. 503.

Cleans INSULATING OIL AT LOW COST

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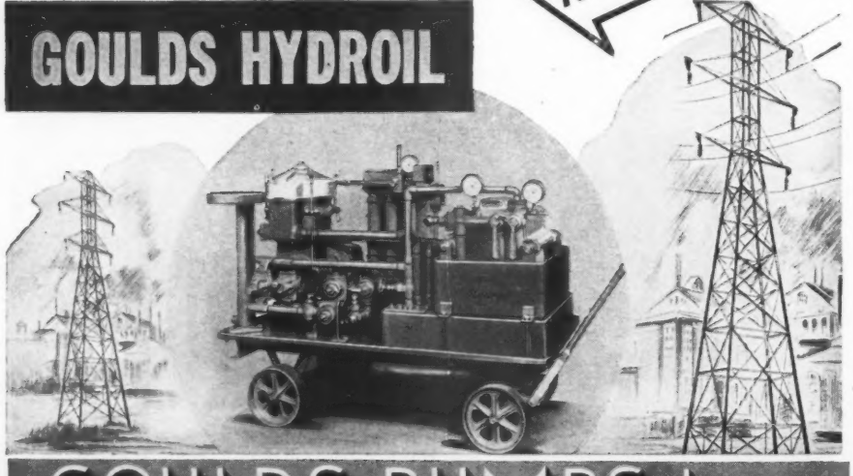

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ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities

8430

JACKSON, TENN.—West Tennessee Power & Light Company's fight against a municipal electrical system in this city has been transferred to the U. S. Supreme Court. The company filed suit in federal court for an injunction against the city entering the power business on the ground that the franchise granted by the city to the company prevented such a move. Judge John D. Martin denied the injunction and the Court of Appeals, at Cincinnati, has affirmed Judge Martin. The High Court has been asked to review the entire proceedings.

Recent Rate Changes

BIRMINGHAM ELECTRIC COMPANY'S Commercial customers will save $176,000 a year, or 10 per cent of the charges under the existing rates, under an order issued recently by the Alabama Public Service Commission. The order also makes other changes that eventually will save customers an estimated $52,000 a year additional, making a total of $228,000. The new schedule applies to all meter readings made on or after September 1 and affects all commercial customers, except minimum use customers and some of the customers now being served power under Schedule D.

OKLAHOMA UTILITIES COMPANY has filed with the Oklahoma Corporation Commission a new schedule of electric rates which will give consumers at Fairfax and Cleveland lower rates, effecting for consumers at Cleveland savings of approximately $7,000 annually and savings of $9,000 annually for Fairfax. The new rates will become effective with August billings. The new rates are 5 cent per kilowatt-hour for the first 100 kw.-hr., 3 cents per kilowatt-hour for the next 100 and 2½ cents per kilowatt-hour for the excess.

CONNECTICUT LIGHT & POWER COMPANY has announced a rate reduction for Norwalk which it is estimated will save consumers $47,000 a year. The new rate will be $1 per month for 6 kw.-hr. or less with 3.5 cents for each additional kiolwatt-hour. The reduction is possible through the elimination of the area charge.

IOWA-NEBRASKA LIGHT & POWER COMPANY has announced a new reduction in its electric rate schedules in Lincoln. The new rates which the company proposes to put into effect at an early date follow: Residence rate—Fixed charge per customer per month, 40 cents plus; first 40 kw.-hr. per month, 4 cents per kilowatt-hour; next 40 kw.-hr. 3 cents per kilowatt-hour; next 120 kw.-hr., 2.25 cents per kilowatt-hour; excess over 200 kw.-hr., 2 cents per kilowatt-hour. Five per cent discount for prompt payment of bill. Commercial rates —Fixed rate per customer per month, 40 cents plus; first 40 kw.-hr. per month, 4 cents per kilowatt-hour; next 160 kw.-hr., 3.5 cents per kilowatt-hour; next 800 kw.-hr., 3 cents per kilowatt-hour; next 4,000 kw.-hr., 2.25 cents per kilowatt-hour; excess over 5,000 kw.-hr., 2 cents per kilowatt-hour. Five per cent discount for prompt payment of bill. L. R. King, president, stated that this is the third rate reduction the company has made in Lincoln within the past three years. He said these reductions had amounted to $100,000 per annum in savings. The Lincoln municipal light plant recently submitted to the city an exhaustive report of Black & Veatch, consulting engineers, recommending a new rate structure estimated to save municipal users $18,763 annually.

REA Funds Allotted; New Contracts Let

Among the recent allotments made by the Rural Electrification Administration are the following:

IOWA—Glidden Rural Electric Co-operative, $100,000 to build 93 miles of line to serve 256 customers. Humboldt County Rural Electric Co-operative, $175,000, 165 miles, 385 customers. Guthrie County Rural Electric Co-operative, $195,000, 180 miles, 471 customers. Franklin Rural Electric Co-operative, $101,000, 96 miles, 249 customers. Grundy County Co-operative Electric Assn., $288.000, 283 mi'es, 700 customers. Butler County Rural Electric Co operative, $128,000, 134 miles, 346 customers. Wright County Rural Electric Co-operative, $170,000, 174 miles, 478 customers. Pocahontas County Rural Electric Co-operative, $219,000, 215 miles, 560 customers. Hancock County Rural Electric Co-operative, $215,000, 232 miles, 590 customers. Greene County Rural Electric Co-operative, $151,000, 153 miles, 386 customers. Hardin County Rural Electric Co-operative, $147,000, 148 miles, 386 customers.

KENTUCKY—Jackson Purchase Rural Electric Co-operative, $55,000 to build 58 miles of line to serve 301 customers. Clark Rural Electric Co-operative, $173,000, 161 miles, 675 customers.

MINNESOTA—Meeker Co operative Light & Power Association, $165.000 to build 144 miles of line to serve 382 customers. Minnesota Valley Co-operative Light & Power Association, $288,000. 288 miles, 864 customers. South Central Electric Association, $271,000, 248 miles, 517 customers. Lake Region Co-operative Electrical Association, $252.000, 242 miles, 682 customers. Peoples Co-operative Power Association, $180.000, 162 miles, 428 customers. Minnesota Valley Electric Co-operative, $251,000, 218 miles, 575 customers. Blue Earth-Nicollet Electric Association, $250,000, 250 miles, 628 cus tomers.

MISSISSIPPI—Hancock Electric Power Association, $50,000 to build 60 miles of line to serve 198 customers. Twin County Electric Power Association, $195,000 208 miles, 458 customers. Delta Electric Power Association, $396,000, 401 miles, 2,232 customers.

MONTANA—Sun River Electrification Association, $74,000 to build 74 miles of line to serve 225 customers. Yellowstone Valley Electrification Association, $144,000, 128 miles, 425 customers.

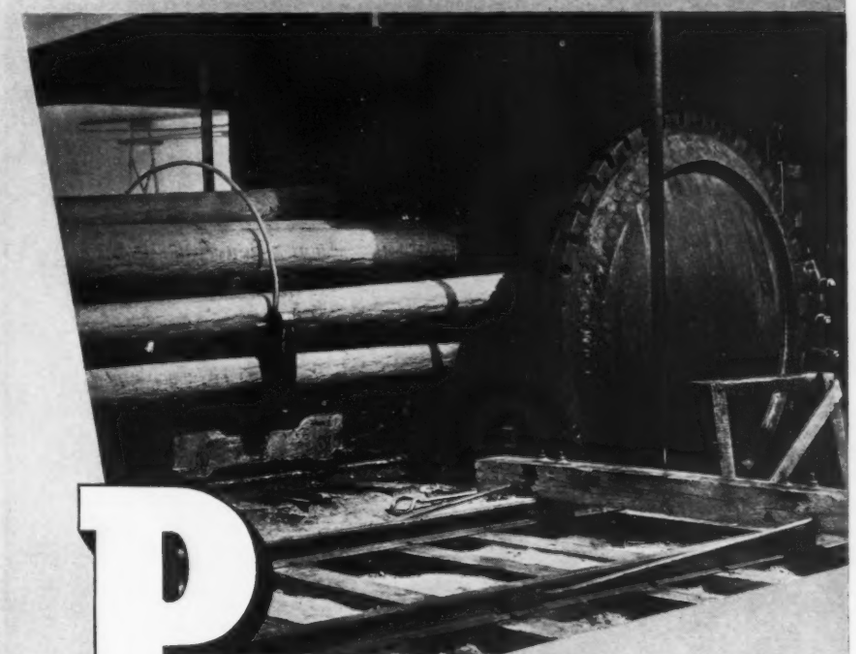
NEBRASKA—Norris Rural Public Power District, $196,000 to build 204 miles of line to serve 612 customers. Cuming County Rural Power District, $216,000, 224 miles, 529 customers.

NORTH CAROLINA—Caldwell Mutual Corporation, $128,000 to build 128 miles of line to serve 384 customers.

OHIO—Inter-County Rural Electric Co-operative, $197,000 to build 197 miles of line to serve 591 customers. United Rural Electric Co-operative, $309,000, 307 miles, 1,114 customers. Hancock-Wood Electric Co-operative, $333,000, 321 miles, 972 customers.

PENNSYLVANIA — Northwestern Rural Electric Co-operative, $357,000 to build 319 miles of line to serve 1,388 customers. Southwest Central Rural Electric Co-opera tive, $145,000, 140 miles, 521 customers. Tri-County Rural Electric Co-operative, $120,000, 100 miles, 462 customers. Claverack Electric Co-operative, $321,000, 331 miles, 882 customers.

THE PICK OF THE PINES FOR BETTER POLES



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ADDS YEARS OF USEFUL SERVICE

The Wood Preserving Corporation at its many plants has adequate facilities for pressure-treating the "pick of the pines." Years of service in handling rush jobs promptly and efficiently makes The Wood Preserving Corporation a most dependable source of supply. Research technicians are ready to help you with any problem involving poles or other treated timber. Write for quotations or other information.

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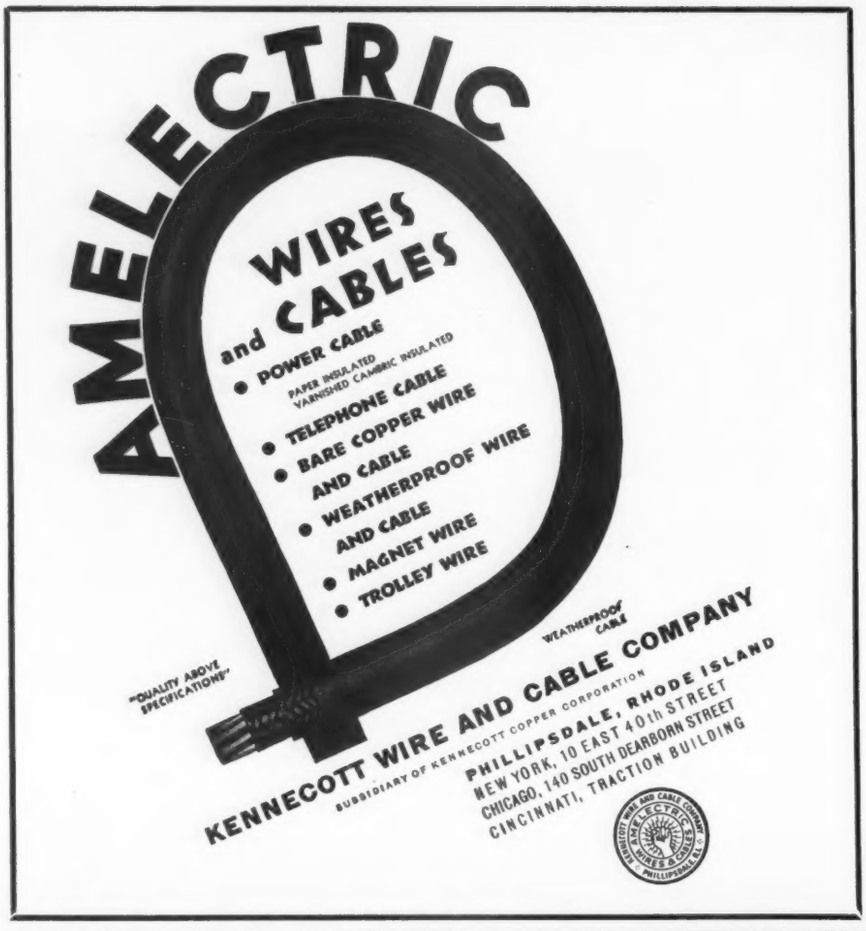

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TONG TEST AMMETERS

PUERTO RICO—Utilization of Water Resources, $460,000 to build 300 miles of line to serve 3,500 customers.

TEXAS—Upshur Rural Electric Co-operative, $125,000 to build 121 miles of line to serve 601 customers. City of Seymour, $104,000, 115 miles, 440 customers.

VIRGINIA—Farmers Rural Utilities, Inc., $137,000 to build 126 miles of line to serve 497 customers. Southside Electric Co-operative, $333,000, 356 miles, 1,255 customers. Central Virginia Electric Co-operative, $100,000, 92 miles, 356 customers.

WISCONSIN—Columbus Rural Electric Co-operative, $75,000 to build 75 miles of line to serve 225 customers. Barron County Electric Co-operative, $91,000, 84 miles, 291 customers.

•

Sales Opportunities

CEDAR RAPIDS, IOWA—Iowa Electric Light & Power Company, Cedar Rapids, plans additions in primary and secondary lines in parts of Iowa, Linn, Jasper, Jones and Marshall Counties for extensions in rural electric system. Work scheduled to begin soon. Permission has been secured.

LAFAYETTE, TENN.—Tri-County Electric Membership Corporation, care of Daniel T. Duncan, Ninety-Six (Greenwood County), S. C., consulting engineer, is concluding arrangements for federal aid in amount of $4,000,000 for proposed hydro-electric generating plant on Barren River, Allen County, Ky., vicinity of Jews Harp Bend, where site is bein secured. Power dam will be 110 feet high and 1,500 ft. long. Equipment installation is being determined and call for bids will be made in near future. Project will include a standby generating station of diesel engine-generator type. A 44,000-volt transmission line will be constructed from power dam to connections with several new power substations to be constructed at different points in association territory, which includes rural electric systems in parts of Sumner, Clay, Trousdale and Macon Counties, Tenn., and Barren, Allen and Monroe Counties, Ky.; new line will be about 50 miles long. P. M. Sullivan, Lafayette, electrical engineer, will be in charge of transmission line and power substation construction; Mr. Duncan, noted, is engineer for hydro-electric development.

DETROIT, MICH.—Rotary Electric Steel Company, Eight-Mile and Mound Roads, plans installation of motors and controls, regulators, conveyors and other equipment in new addition to steel mill, 140 x 160 ft., reported to cost in excess of $200,000, with machinery. Shreve, Anderson & Walker, Marquette Building, Detroit, are architects.

WICHITA FALLS, TEX.—Has concluded arrangements for federal loan and grant totaling $1,750,000 for proposed municipal electric light and power station of about 8000-kw. rating, with distributing lines and street-lighting system. Project is scheduled to mature soon.

SANTA MARIA, CALIF.—Midland Counties Public Service Corporation, Fresno, Calif., has authorized immediate construction of new transmission line from Santa Maria to Guadalupe, Calif., using copper conductor.

MARIANNA, FLA.—West Florida Co-operative Association, Marianna, plans electric generating station for power supply for new rural elecrtic system. Bids are

scheduled to be asked soon. Entire project will cost over $300,000. Financing has been arranged through federal aid.

SIOUX CITY, IOWA—Iowa Public Service Company, Sioux City, plans extensions in primary and secondary lines in parts of Audubon, Bremer, Shelby, Sac, Plymouth and Calhoun Counties for expansion in rural electric system. Proposed to begin work soon. Permission has been granted.

MULESHOE, TEX.—American Crystal Sugar Company, Boston Building, Denver, Colo., plans installation of motors and controls, regulators, conveyors, switchgear and other equipment in proposed new beet sugar mill now being considered in vicinity of Muleshoe, Bailey County. A power house will be built. Entire project will cost over $1,000,000.

PIQUA, OHIO—Plans extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost about $480,000. Financing is being arranged through federal aid. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

WEIRTON, W. VA.—Weirton Steel Company plans installation of heavy duty motors and controls, switchgear, regulators, conveyors, electric hoists and other equipment in new additions to local mill for production of steel rails, structural shapes and other steel products. Cost about $5,000,0000. Project is scheduled for completion in summer of 1939. Company is a subsidiary of National Steel Corporation, Pittsburgh, Pa.

BONNEVILLE, ORE.—United States Engineer Office, Bonneville, receives bids until August 19 for 287 floodlights, each 500-watt capacity (Circular 10).

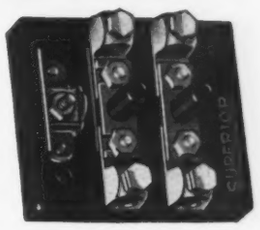
CHATTANOOGA, TENN.—Chattanooga Electric Power Board will take bids to close about August 20 for installation of municipal underground conduit system in downtown district, including transformer vaults, manholes and other facilities. Cost about $370,000. Financing has been arranged through federal aid (Contract No. 4).

LINCOLN, NEB.—Has plans maturing and will take bids soon for extensions and improvements in municipal electric power plant, including installation of new equipment and changes in present apparatus. Cost about $175,000. Financing has been arranged through federal aid. D. L. Erickson is city engineer; Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

SEATTLE, WASH.—Has preliminary plans for new municipal hydro-electric generating plant at Ruby dam site, Whatcom County, and will arrange financing through federal aid in amount of $5,135,000 for project, of which approximately $2,300,000 will be represented by a federal grant. A transmission line will be built to connect with other hydro-electric stations of municipal power system, and with power substation at Seattle. Proposed to proceed with development as soon as financing has been consummated.

MEMPHIS, TENN.—Memphis Light and Water Board, City Hall, is arranging early call for bids for installation of new municipal underground conduit system in downtown district, including transformer vaults, manholes and other operating facilities. Cost estimated about $430,000. Financing has been secured through federal aid.

SELF-CONTAINED METER TEST BLOCKS



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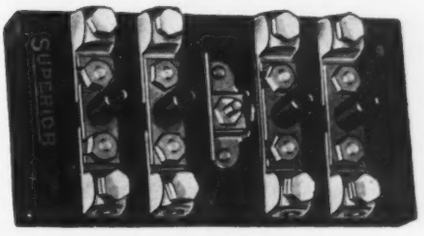

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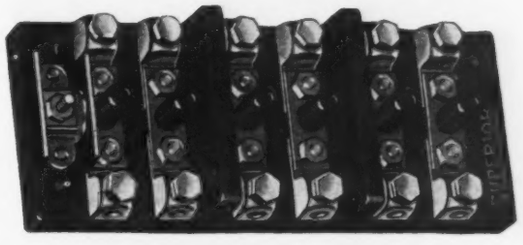
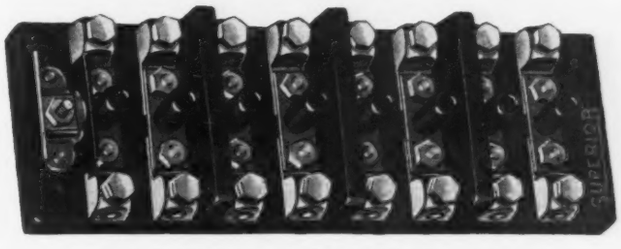


Cat. No. 8626-F Meter Test Block
(6 Pole, self-contained)



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Lots of Talk, but Where Are the Facts

[*Continued from page 54*]

taging" the case, was "tampering" with witnesses and was "attempting to bring about a decision against his own agency."

So also with Morgan's showing copies of his memo on power pooling to various persons before making his case to the President.

On Morgan's continual complaint that the two other directors short-circuited him, would map out their plans before calling a meeting, and then just vote action without discussion, the committee members also are not much impressed.

Not that they privately approve such a method for conducting a half-billion dollar enterprise, but they have got so terribly tired and bored listening to these three men that they would approve almost any device used to obtain cloture!

The only reason most of the committee members do not regard the famous "changed minutes" charge against Lilienthal with the same dispassion is the extraordinary concern which was manifested at preventing A. E. Morgan from obtaining evidence about it. The third-degreeing of a young clerk until he had to be put under a physician's care—the "incommunicado" order to employees as respect contact with Morgan or any of his friends.

In fact, there was so much smoke that the committee suspects just maybe there were a few sparks!

Educational Films Well Received

[*Continued from page 35*]

a day, we expect it to have a life of at least five years.

Although the picture itself is of an educational character, we have not been backward in using it to promote our service, and regularly distribute sales literature, without objection to the audience, after seeing the film.

As an indication of the reception given to our picture, we have received several hundred letters from organizations which have booked the program, expressing appreciation and commendation on the method of our presentation.

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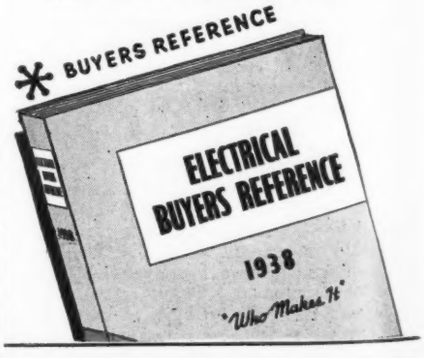
● **WHY NOT MAKE IT A HABIT, TOO? You'll find Electrical Buyers Reference tells you quickly and accurately what you want to know about thousands of products—made by hundreds of manufacturers. Make it your FIRST place to look for buying information.**



ELECTRICAL BUYERS REFERENCE

Electrical World Edition
Published Annually
A McGraw-Hill Service
330 W. 42nd St. New York, N. Y.

Cleaning Chimney Gases by Dry Type Separators

[*Continued from page 51*]

These separators may be installed in multiple to handle partial loads more effectively. Draft losses are said to be small. Separation of 90 per cent of the particles 20 micron or larger is claimed for this separation.

None of these cyclone systems embody any moving parts other than the adjustable vanes on the Van Tongeren and multi-cyclone and any necessary shut-off dampers in the Sirocco. The volute part is frequently of cast iron, with the remainder of sheet metal. Their weight should, therefore, not be excessive. Maintenance will be principally the replacement of worn volute section through abrasion. One would, therefore, conclude that installation costs of such systems should be moderate. Space requirements may be rather large.

Electrostatic precipitation

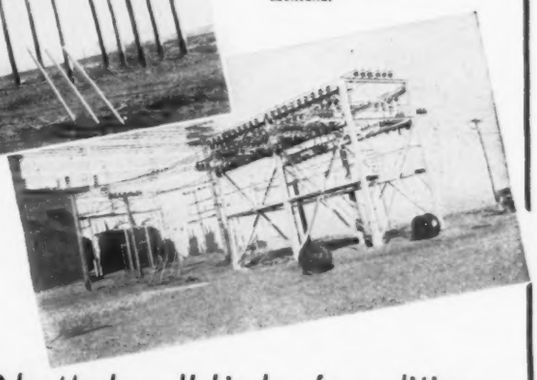
Electrostatic precipitation of dust and smoke is a widely used system in this country. The development of this system in America is credited to Dr. F. G. Cottrell, while in Great Britain it is stated that Sir Oliver Lodge first applied these methods. The flue gases pass through pipes or between plates which are grounded and serve as positive electrodes to collect dust. The negative electrodes are suspended centrally between these pipes or plates. In America the plate system (Fig. 4) is generally used.

In this system a series of grounded parallel positive plates spaced 10 to 12 in. apart are arranged so that the gases pass between them. Midway between the plates an insulated framework of wires or rods is suspended to form the negative electrodes. This framework is negatively charged with 50,000 to 70,000 volts direct current supplied by a specially designed mechanical rectifier from standard single-phase alternating current. Dust particles become ionized and move to the positively-charged grounded plates, which may be of concrete, from which it is scraped, rapped or otherwise removed into quiescent dust hoppers below these plates. Pressure drop through the Cottrell precipitator is said to vary from 0.1 to 0.5 in. of water. Gas velocities may vary from 5 to 10 ft. per second.

Efficiencies are reported to range

• *Wood Pole Structure for 66000 v distribution system forming a turn of ninety degrees.*

• *Steel Switching Tower erected at Fort Peck, Montana.*



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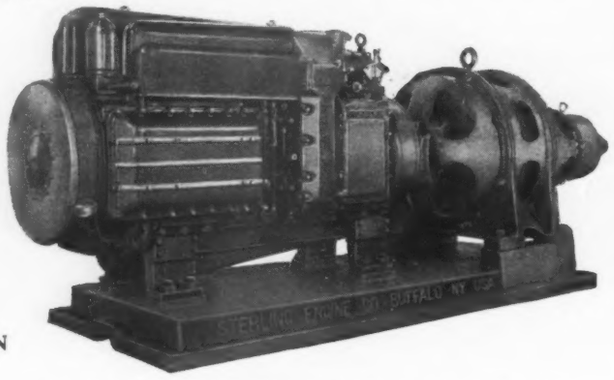

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from 90 to 95 per cent at rated capacity, depending upon the length of the charged path of the gases. Power requirements are claimed to vary from 0.2 to 1 kw.-hr. per 100,000 c.f.m. of gases. The first cost of this device has been rather high. Efficiency tends to decrease at increased ratings, since some dust particles are swept out of the charged field by the gas velocity before reaching the positive terminals.

In England the cell type of precipitator is preferred with cells of pipe or hexagonal form of about 10 in. diameter. Here each cell has its own negative electrode wire, which is kept taut by a weight at its lower end. It operates in the same way as the plate type. British engineers claim that this cell type removes more of the unburned carbon particles than the plate type. The cell type will be tried shortly for the removal of excess moisture from gases after passing through the wet washers of one of the British plants.

The efficiencies stated for the various systems are ratios of the quantity by weight of dust removal to the total quantity entering the system. Naturally, the largest particles are separated most easily. The dust which leaves in the escaping gases are the finer dust particles, which in some cases are less than 20 microns in diameter. Since the smallest particle observable by unaided eyesight is about 35 microns in diameter, it is apparent that the escaping particles will not cause appreciable inconvenience, particularly as they disperse easily in the wind and settle over wide areas.

Dust separators of the dry type may be placed inside or outside of the power house. Since the cleaned gases pass directly to the chimney, such separators are generally placed on the power house roof adjacent to the stack. In this location weight is a factor controlling installation cost.

•

Locomotive Shipments Gain

Shipments of mining and industrial electric locomotives during the second quarter, as reported by ten manufacturers, comprising practically the entire industry, amounted to 78, valued at $447,836, against 67 valued at $312,573 for the first quarter and 142 valued at $925,781 in the second quarter of 1937, according to the Department of Commerce.

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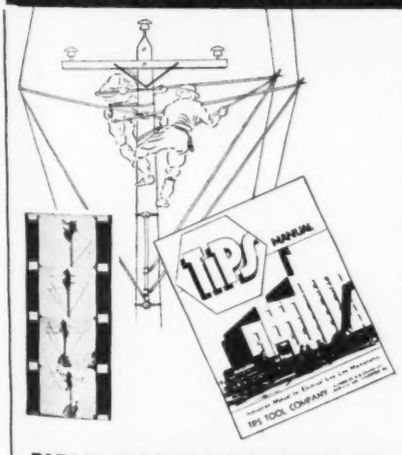

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Transmission at 230 Kv. Built at $10,300 per mile

[*Continued from page 48*]

Anaconda Wire & Cable Company. It is known as the twisted I-beam hollow copper cable and is made up of a twisted copper I-beam surrounded by two layers (opposite lays) of copper strands laid outside of the core.

The core has a cross-sectional area of 44,300 circ.-mil. The 50 strands, each 0.0966-in. diameter, aggregate 466,600 circ.-mil, making a total of 510,900. Outside diameter is 1.004 in. and the weight 1.610 lb. per foot. The breaking strength is about 22,500 lb. This outside diameter is about the minimum that can be used for 230 kv. without excessive corona. Electrical conductivity of the two conductors is approximately equal.

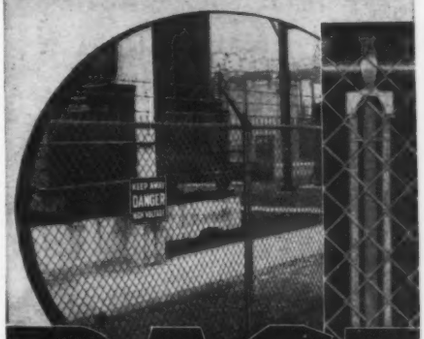
The copper conductor came in reels about 1 mile in length. Except over Dry Lake, where the specifications required that the cable be prevented from touching the alkali-covered surface, stringing resembled that for aluminum. On this section a "bull-wheel" was used to maintain tension as cable passed from the reel. The winch line from the tractor was used to pull each cable separately. Copper cable was prestretched at 7,500 lb. for ten minutes, then slacked off to normal, about 5,800 lb. at ordinary temperatures.

Aluminum sag growth stops at 2 ft.

The line was staked to provide a minimum clearance of 30 ft. of conductor to ground at 130 deg. F. wire temperature except in mountainous country accessible only to pedestrians, where in a few instances clearances were cut to about 25 ft. These figures are about 3 ft. above the legal clearance.

Since the aluminum cable continues to stretch for a long period even though prestretched to its design maximum tension, the cable was sagged about 1.5 ft. above profile position in normal spans. Observations made on some of the first spans strung indicate that in a period of nearly eighteen months the cable has dropped about 2 ft. from its original position. One foot of this drop occurred in the first 20 to 25 days, another half foot occurred the next three months, and the last half foot in the next eight or nine months. There has been no appreciable drop in the last six months. With this drop, the cable is now slightly below profile position, but the clearance is still some 2.5 ft. greater than legal

LOOK
TO PAGE FOR THIS SPECIALLY DESIGNED P·12 WING-CHANNEL POST



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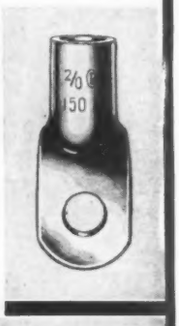

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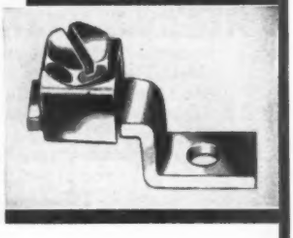

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For about 1 mile on each side of all pumping plants and for 2 miles adjacent to the Boulder rack two ½-in. overhead ground wires are used. In these sections the conductor tension is reduced to provide greater than normal clearance between conductor and ground wires.

Sand local, aggregate shipped in

Tower legs in all cases lapped the stub angles and were bolted thereto.

Forms for the concrete anchors consisted of 14 gage iron, rolled to fit the required tapered shaft dimensions, with a lap of about 1 in. along the vertical joint. Welded stops kept the form to size and several iron hoops of correct sizes, slipped over the form, kept it from spreading.

Sand for concrete was obtained from approved pits along the line. Coarse aggregate had to be shipped in for about half of the line, some was obtained from local gravel plants, and a small amount was screened by hand from approved pits. Victor sulphate resistant cement in paper sacks was used throughout the line. District tests proved the superiority of this cement to resist the general alkaline soil of the desert, and its cost of 5 cents per sack additional was believed well warranted because of a number of severe alkali concentrations along the line. Six sacks of cement per cu.yd. of concrete in place was the standard mix. Aggregates were carefully proportioned and all concrete was well tamped in place. Adjustable pipe jacks held the tops of the stub angles in place while pouring and hard boulders were generally used to wedge the bottoms into position.

There is a total of 940 towers on the line, of five types, each with its own footing dimensions. The types and number used follow:

S.	Standard suspension (Fig. 2b)	736
A.	Angle suspension and heavy loading suspension (Fig. 7a,b)	87
D.	Dead end (Fig. 7c)	37
H.	Special suspension for wide conductor spacing (Fig. 5)	68
R.	Special heavy suspension for railroad and major telephone line crossings	12

All towers are four-legged structures of the conventional type.

The first section of the tower was usually erected by the combined first section and layout crew. This crew "laid out" the tower steel around the footings, in order of erection, and assembled whatever members were normally lifted together. The adjacent lower legs and diagonals on the transverse faces of the towers were then assembled flat and hinged into place, and longitudinal diagonals placed. The tower crew, consisting usually of ten to twelve men, followed this crew. Tower legs were erected using a light 27-ft. spar gin pole, which was lashed to the lower leg and transferred from corner to corner. As each leg was lifted sheaves were hooked into the top for use in sending up all members required in the section. A line (or lines) attached to a truck was usually used to lift heavy members. Winch lines were seldom used as they were not as fast as the

Mile & Tower		23-2	23-3	23-4	24-1	24-2	24-3	24-4	25-1	25-2	25-3
Station		1155+35	1170+62	1182+80	1196+05	1214+70	1228+45	1241+25	1254+71.55	1267+63	1273+58.7
Line Angle		—	—	—	—	—	—	—	—	—	23°24' Lt
El. of ℄ Stake		2696.95	2734.52	2721.19	2657.74	2643.27	2704.33	2733.45	2727.70	2743.88	2760.96
Type		S	S	S	S	S	S	S	S	S	D
Legs or Extensions	A	+6	+6	+6	+0	+6	+6	+6	+0	-6	+0
	B	+6	+6	+6	+0	+6	+6	+6	+0	+0	+0
	C	+6	+6	+6	+0	+6	+6	+6	+0	+0	+0
	D	+3	+6	+6	+0	+6	+6	+6	+0	-6	+0
℄ Line "A" Footing "A"		2695.80	2734.40	2721.70	2656.90	2642.30	2704.10	2733.80	2726.20	2746.20	2758.30
Footing Type		Conc.	Conc.	Conc.	Conc.	Conc.	Conc.	Conc.	Conc.	Conc.	Conc.
Day Excavation for Footings		0.9	1.3	2.3	2.2	1.2	3.1	1.3	1.0	0.2	4.9
Misc. Excav.	Rock	—	—	—	—	—	—	—	—	—	
	Earth	—	—	—	—	—	—	—	—	—	
No. Units Insulators		13	13	13	13	13	13	13	13	13	15
Center Hanger		—	—	—	—	—	—	—	—	—	
G.W. Bracket		—	—	—	—	—	—	—	—	—	
Extra Work		—	—	—	—	—	—	—	—	—	—
Remarks											

To Hayfield

Legs longer or shorter than standard are indicated thus +6 or -6 respectively. Extensions are indicated thus 6. Last revision is marked ○

No. Date Drn. Ck'd. Description Rec. Appd.

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
230 KV TRANSMISSION LINE
STRUCTURE DATA LIST
BOULDER TO HAYFIELD
Drawn J.C. Traced Checked A.L. Recommended Approved
April 27, 1936 C-275-11

Mile 23

Fig. 8—Typical structure data sheet for contractors

truck method. Under good conditions a crew erected 2½ towers per day, although three-tower days were numerous while a bonus arrangement was being tried out by the contractor. The erection crew generally hung insulators on suspension towers.

Two 15-unit strings at dead-ends

Normal suspension strings consisted of thirteen 10-in. cap-and-pin type Thomas insulators. Dead-ends were made up of two fifteen-unit strings. On Danby Dry Lake, with H-type towers, seventeen units were used in suspension, nineteen on dead-ends. For several miles each side of this section fifteen units were used in suspension, seventeen on dead-ends. Tests previous to construction indicated that the wet flashover voltage was lowered more than 30 per cent by alkali deposited on insulators suspended over the dry lake.

No unusual difficulties were experienced in construction. Hauling of materials (done by the contractor) was a major item, the average haul of rail-shipped materials being 24 miles (72 per cent over dirt roads), maximum 60 miles.

Many sites were inaccessible to trucks. To some of these materials were hauled in by tractor. To others, inaccessible to tractors, skylines were used. Man-power alone was used in a few cases, and two, three or even four men on a wheelbarrow was not an uncommon sight at the worst locations.

The line contractor, Fritz Ziebarth, completed all work possible under his contract at the time, on August 7, 1937, some five months before the contract date of completion.

F. E. Weymouth is general manager and chief engineer of the Metropolitan Water District. J. M. Gaylord is chief electrical engineer. Survey and construction work was under the field supervision of Robert N. Allen for the district. Office design of towers was directed by C. S. Glazbrook.

•

Output in West Virginia

Electric power production by water power in West Virginia in the first half of 1938 was up 30 per cent, to 283,911,000 kw.-hr., over the first six months of 1937, but production from fuels fell 25 per cent to 890,223,000,000 kw.-hr., according to the monthly index of the Charleston (W.Va.) Chamber of Commerce.

★

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BOWLING GREEN, KY.

Cost Comparison—Protector Tubes vs. Ground Wires

[*Continued from page 42*]

on H-frame structures and that 15/16 in. is adequate on single-pole structures; that two 20-ft. driven grounds are adequate for all conditions on the long span H-frame structures, and that one is sufficient for single-pole shorter spans. For the purpose of this comparison it did not appear necessary or desirable to consider the types or sizes of line conductors involved, although it may be seen from the design of the structures that conductor sizes may be permitted between the ranges of No. 2/0 and No. 4/0 and that span lengths may be in the order of 450 to 800 ft. for H-frames and from 275 to 375 ft. for single-pole construction, without any appreciable change in cost. In addition, and considered most important, is the assumption that any comparison of costs must be made on a basis of anticipated equal results in operation, expressed in outages per 100 miles per year from lightning causes.

Details of the structure studied appear in the sketches and the explanatory text accompanying them. Itemized costs for the various structures are given in Tables I and II. The graph shows total costs (not including energy conductors) per mile of line for different spacings of the structures. These evidences indicate rather positively a lower cost for tube protection on all phases with H-frame structures, but it appears necessary to confine tube installation to one conductor in order to make comparison possible between tube and ground wire protection on single-pole structures.

•

Puerto Rico Agency Gets REA Allotment

REA recently announced an allotment of $500,000 to the Utilization of Water Resources, Guayama, Puerto Rico. This allotment to the Puerto Rican government agency is the first made by REA for use outside the continental limits of the United States. When the final loan contract is executed it will enable the organization to extend its lines about 300 miles and to serve 3,500 rural families.

Existing retail rates of the Puerto Rican government-controlled agency will be extended to the new customers. The Utilization of Water Resources now operates a number of hydro-electric generating plants in the mountain regions of Puerto Rico. Engineers report that less than one-fifth of the potential hydro-electric generating capacity of the island has been developed. This potential generating capacity, totaling 100,000 kw., assures a continuing and adequate supply of electric power.

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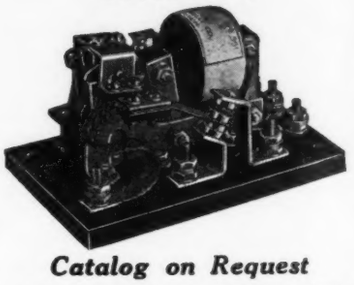

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Kitchen Plans Sell Major Appliances

[*Continued from page 45*]

and to initiate kitchen planning projects when calling on customers for other purposes, such as lighting and equipment demonstrations. In 1937 this activity of the home economists resulted in the sale of four major appliances for each ten customers who were interviewed and listened to the story.

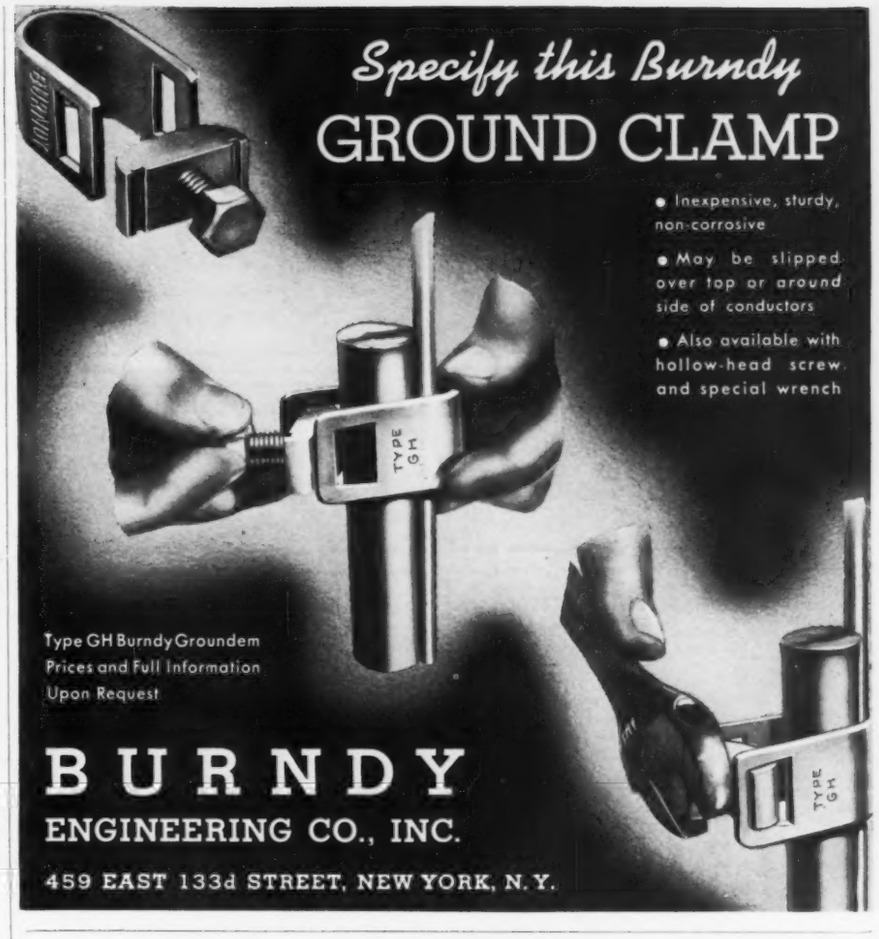
Home service, too, is responsible for making surveys of kitchens when drawings are required. We have one man who devotes his entire time to drawing plans and encouraging the use of the kitchen planning story by our sales organization. A portion of plans presented in our territory are prepared by co-operating manufacturers and distributors. During 1937 73 per cent of such plans resulted in action on the part of the customer and sales amounted to almost two appliances per customer.

Our merchandise salesman's part in this particular activity is more informal, in that he is not asked to report his use of the kitchen planning story for a formal record. He is continually encouraged to take full advantage of the story on every occasion offered. He has in his territory a home economist to aid him whenever necessary and has available the free plan drawing service. Even though our promotion always features the complete kitchen, our selling is generally restricted to step-by-step method. The merchandise salesman paves the way for an additional appliance, when getting an order for the first one.

•

France to Increase Output

With hydro-electric power consumption in France increasing by at least 1,000,000,000 kw.-hr. annually, the French government has announced a new development program in this field entailing the expenditure of approximately 3,000,000,000 francs. This will include the utilization of certain waterfalls and the development of the interconnecting electrical system all over the country, as well as the improvement of the present electrical distribution system. The principal problem is that the hydro-electric power now available will soon be insufficient to meet all requirements. Present needs are for 18,000,000,000 kw.-hr.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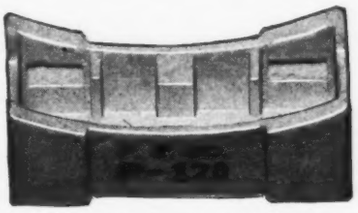

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[*Continued from page 49*]

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Harmonics are shown by the shape of the loop, the third harmonic making a four-sided loop and the fifth a six-sided loop. Both the third and fifth harmonics are noticeable in these figures, but were not noticeable in the sine wave.

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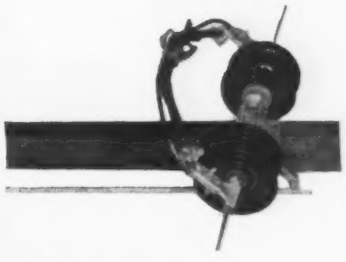

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